
Chapter 10 - Erosion and Sediment Control

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Chapter 10 - Erosion and Sediment Control

10.1 Introduction

Erosion and sedimentation are natural or geologic processes whereby soil materials are detached and transported from one location and deposited in another, primarily due to rainfall and runoff. Accelerated erosion and sedimentation can occur at times in conjunction with highway and transportation facility construction. This accelerated process can result in significant impacts such as safety hazards, expensive maintenance problems, unsightly conditions, instability of slopes, and disruption of ecosystems. For this reason, the total design process must be done with consideration given to minimization of erosion and sedimentation.

10.1.1 Objective

The purpose of erosion reassessing and sediment control is to provide an effective plan to control soil erosion and prevent sediment from leaving the construction site. The Department's annually approved erosion and sediment control and stormwater management standards and specifications. Additional information can be found in the Virginia Erosion and Sediment Control Handbook and the Virginia Erosion and Sediment Control Regulations. This Handbook can be ordered from the Virginia Department of Environmental Quality at (804) 698-4000, or can be found at the website: <http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx> .

The Virginia Erosion and Sediment Control Regulations can be access from the website, <http://lis.virginia.gov/000/reg/TOC09025.HTM.HTM#C0840>"

10.1.2 Principal Factors Influencing Erosion

10.1.2.1 Soil Characteristics

The properties of soil which influence erosion by rainfall and runoff are ones which affect the infiltration capacity of a soil and those which affect the resistance of soil particles be detached and carried away by falling or flowing water. Soils containing high percentages of fine sands and silt are normally the most erodible. As the clay and organic matter content of these soils increases, the potential for erosion decreases. Clays act as a binder to soil particles, thus reducing the potential for erosion. However, while clays have a tendency to resist erosion, once eroded they are easily transported by water. Soils high in organic matter have a more stable structure which improves their permeability. Such soils resist raindrop detachment and infiltrate more rainwater. Clear, well-drained, and well-graded gravels and gravel-sand mixtures are usually the least erodible soils. Soils with high infiltration rates and permeabilities reduce the amount of runoff.

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10.1.2.2 Vegetative Cover

Vegetative cover plays an important role in controlling erosion in the following ways:

- Shields the soil surface from the impact of falling rain
- Holds soil particles in place
- Maintains the soil's capacity to absorb water
- Slows the velocity of runoff
- Removes subsurface water between rainfalls through the process of evapo-transpiration

By limiting and staging the removal of existing vegetation, and by decreasing the area and duration of exposure, soil erosion, and sedimentation can be significantly reduced. Special consideration should be given to the maintenance of existing vegetative cover on areas of high erosion potential such as erodible soils, steep slopes, drainage ways, and the banks of streams.

10.1.2.3 Topography

The size, shape, and slope characteristics of a watershed influence the amount and rate of runoff. As both slope length and gradient increase, the rate of runoff increases and the potential for erosion is increased. Slope orientation can also be a factor in determining erosion potential.

10.1.2.4 Climate

The frequency, intensity, and duration of rainfall are fundamental factors in determining the amounts of runoff produced in a given area. As both the volume and velocity of runoff increase, the capacity of runoff to detach and transport soil particles also increases. Where storms are frequent, intense, or of long duration, erosion risks are high. Seasonal changes in temperature, as well as variations in rainfall, help to define the high erosion risk period of the year. When precipitation falls as snow, no erosion will take place. However, in the spring the melting snow adds to the runoff and erosion hazards are high. Because the ground is still partially frozen, its ability to absorb runoff is reduced. Frozen soils are relatively erosion-resistant. However, soils with high moisture content are subject to uplift by freezing action, and are usually very easily eroded upon thawing.

10.2 Design Policy

A policy for erosion and sediment control is stated in the American Association of State Highway Transportation Officials' publication, "A Policy on Geometric Design of Rural Highways," as follows:

"Erosion prevention is one of the major factors in the design, construction, and maintenance of highways. Erosion can be controlled to a considerable degree by geometric design particularly relating to the cross section. In some respects the control is directly associated with proper provision for drainage and fitting landscape development. Effect on erosion should be considered in the location and design stages."

"Erosion and maintenance are minimized largely by the use of flat side slopes, rounded and blended with natural terrain; drainage channels designed with due regard to width, depth, slopes, alignment and protective treatment; located and spaced facilities for ground water interception; dikes, berms and other protective devices; and protective ground covers and planting."

10.2.1 Federal Policy

As a result of the National Environmental Policy Act of 1969 and the Chesapeake Bay Protection Act, much attention has been directed to the control of erosion and sedimentation. As a result of this concern, numerous state and federal regulations and controls governing land disturbing activities have been developed and published. Federal control requirements are enforced by numerous agencies such as the Corps of Engineers (COE), Department of Conservation and Recreation (DCR), Environmental Protection Agency (EPA), Fish and Wildlife Service (FWS), etcetera, through their administration of various permitting requirements (Section 404, Section 402 of the Federal Water Pollution Control Act (FWPCA), and Section 9 and 10 of the River and Harbor Act).

10.2.2 State Policy

The Department of **Environmental Quality**^{*} annually reviews and approves VDOT's Erosion and Sediment Control Program. This Annual review includes all of VDOT's erosion and sediment control standards, specifications, policies, and design guidelines as outlined in the Road and Bridge Standards, Road and Bridge Specifications, Drainage Manual, Road Design Manual, Instructional and Informational Memoranda, and other associated directives.

VDOT receives an annual approval of its ESC Standards and Specifications from DEQ.

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By its annual approval of VDOT's ESC Standards and Specifications, DEQ authorizes VDOT to administer its ESC Program in accordance with the Approved ESC Standards and Specifications, on all regulated land disturbance activities undertaken by the Department*.

VDOT's approved ESC Standards and Specifications shall apply to all plan design, construction and maintenance activities undertaken by VDOT, either by its internal workforce or contracted to external entities, where such activities are regulated by the Virginia ESC Law and Regulations. During any inspections of VDOT land disturbing activities by DEQ, EPA and other such environmental agencies, compliance with the VDOT's Approved ESC Standards and Specifications (and all parts thereof) will be expected. A standard, specification or product not contained or referenced in VDOT's Approved ESC Standards and Specifications cannot be used unless it is submitted to and approved by DEQ either as a revision to the Approved ESC Standards and Specifications or a project specific variance.

Statewide use of standards, specifications or products not contained in VDOT's DEQ Approved ESC Standards and Specifications will require a revision to the Approved ESC Standards and Specifications. Any revisions to the Approved ESC Standards and Specifications shall be reviewed and approved by DEQ prior to implementation by VDOT. Such review and approval shall be coordinated by the VDOT State Stormwater Program Administrator in the VDOT Central Office with the DEQ Regulatory Programs Manager in the DEQ Central Office Stormwater Management Division.

Where determined necessary to meet an individual project need, VDOT may request DEQ to grant a project specific variance to the Approved ESC Standards and Specifications:

- All requests for project specific variances for those projects being designed in a VDOT District Office shall be coordinated by the District Hydraulics Engineer with the appropriate DEQ Regional Office staff. All variance requests shall be accompanied by complete details and documentation, including justification for the requested variance. Copies of any variance requests, approvals and related correspondence are to be sent to the DEQ Regulatory Programs Manager in the DEQ Central Office Stormwater Management Division and the VDOT State Stormwater Program Administrator in the VDOT Central Office. If the VDOT District Office and the DEQ Regional Office cannot come to agreement on a specific request, or if additional review is necessary, the assistance of the DEQ or VDOT Central Office can be requested.
- All requests for project specific variances for those projects being designed in the VDOT Central Office shall be coordinated by the VDOT State Hydraulics Engineer with the DEQ Regulatory Programs Manager. All variance requests shall be accompanied by complete details and documentation, including justification for the requested variance. Copies of any variance requests, approvals and related

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correspondence are to be sent to the VDOT State Stormwater Program Administrator.

- All requested variances are to be considered unapproved until written approval from DEQ is received.
- All approved variances shall be listed in Note 1 in Section II of the SWPPP General Information Sheets in the construction plans (or other such documents) for the land disturbing activity
- All documentation for and approval of requested variances shall be retained in the appropriate (i.e. design, construction, etc.) files of the proposed activity.
- The VDOT State Stormwater Programs Administrator shall maintain a file of all requested and approved variances.

Nonlinear projects, such as those administered by the VDOT's Capital Outlay Program, are encouraged to utilize VDOT's Approved ESC Standards and Specifications in the development of the ESC Plan for such projects. Where deemed impractical to use VDOT's Approved ESC Standards and Specifications and when approved by the VDOT State Stormwater Program Administrator, DEQ's ESC Standards and Specifications, as outlined in the Virginia Erosion and Sediment Control Regulations and Handbook, may be utilized in combination with VDOT's Approved ESC Standards and Specifications to develop ESC Plans for nonlinear projects. Such projects include, but are not limited to, new and/or additions/modifications to Rest Areas, District or Residency Office complexes, Area Maintenance Headquarters/Repair Shops and buildings on the right of way or associated with bridges/piers/tunnels, spreader/tailgate/wash rack sites, holding ponds or containment pads, fuel dispensing facilities, security facilities and drainage improvements to building/parking sites and structures.

Any maintenance or construction activity that disturbs more than 10,000 square feet (929 m²), or 2,500 square feet (232 m²) in areas defined as Tidewater Virginia in the Virginia Chesapeake Bay Preservation Act, must have a specific erosion and sediment control plan developed and implemented in accordance with VDOT's Erosion and Sediment Control Approved Program. The requirements of the Virginia Erosion and Sediment Control Regulations (VESCR), < <http://lis.virginia.gov/000/reg/TOC09025.HTM.HTM#C0840>>, and the VDOT Erosion and Sediment Control Annual Plan will be incorporated into every design and will be enforced on all VDOT operations.

Refer to **Appendix 10B-1** * for additional policy and design guidelines.

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10.2.2.1 DEQ Certification's

The Virginia ESC Law and Regulations require that the ESC Program administration and the ESC Plan design, implementation and inspection activities be conducted by DEQ certified personnel for all Regulated Land Disturbance Activities.

VDOT's ESC Program will be administrated by a DEQ Certified Program Administrator:

- The Program Administrator shall be the person within the Department who has been designated to have overall responsibility for administration of VDOT's ESC Program.
- The DEQ Program Administrator Certification is acquired by satisfying the DEQ eligibility/training requirements and passing the DEQ Program Administrator Exam or by possessing a DEQ Combined Administrator Certification.
- The State Stormwater Program Administrator in the Central Office Location and Design Division is currently designated as VDOT's ESC Program Administrator.

The Virginia ESC Regulations require that each RLDA be overseen by a DEQ certified RLD:

- The DEQ RLD Certification is required for the VDOT person who has general oversight of the construction phase of a specific RLDA.
- The RLD for a specific RLDA must be identified prior to beginning any land disturbance activity (see note 11* in Section I of the SWPPP General Information Sheets).
- The DEQ RLD Certification is acquired by passing the DEQ RLD Exam or by possessing a DEQ Combined Administrator, Program Administrator, Plan Reviewer or Inspector Certification or by possessing a Professional Engineer, Land Surveyor, Landscape Architect or Architect License pursuant to Chapter 4, Title 54.1, of the Code of Virginia.

The proposed ESC Plan for each RLDA must be reviewed and approved by a DEQ Certified ESC Plan Reviewer to ensure that the ESC Plan has been developed in accordance with VDOT's Approved ESC Standards and Specifications or variances authorized thereto.

- The DEQ Plan Reviewer Certification is required for any person that has responsibility for reviewing and approving the proposed erosion and sediment control plan for a specific RLDA.
- The Certified Plan Reviewer shall be a VDOT employee, or an employee of an engineering consulting firm under contract to VDOT, who has expertise in drainage design and erosion and sediment control design.

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- The DEQ Plan Reviewer Certification is acquired by satisfying the DEQ eligibility/training requirements and passing the DEQ Plan Reviewer Exam or by possessing a DEQ Combined Administrator Certification or by possessing a Professional Engineer, Land Surveyor, Landscape Architect or Architect License pursuant to Chapter 4, Title 54.1, of the Code of Virginia.

A DEQ ESC Inspector Certification is required for those persons having responsibility for ensuring the proper implementation of, or compliance with, the proposed ESC Plan and VDOT's Approved ESC Standards and Specifications, or variances authorized thereto, throughout the construction phase of the RLDA. The ESC Law and Regulations also require that inspections of ESC facilities be conducted by a DEQ certified ESC Inspector.

- The Certified Inspector shall be a VDOT employee or an employee of an engineering consulting firm under contract to VDOT and who is so identified on the SWPPP Certification form LD-445E.
- The DEQ Inspector Certification is acquired by satisfying the DEQ eligibility/training requirements and passing the DEQ Inspector Certification Exam or by possessing a DEQ Combined Administrator Certification.

It shall be the responsibility of the Project Authority to ensure that those staff with the appropriate DEQ Certifications (RLD, Plan Reviewer or Inspector) perform the functions required by the ESC Law and Regulations and noted in Section 10.2.2.1* of this document.

- For the purposes of this document, the Project Authority is defined as that person with overall responsibility of a land disturbing activity or a specific phase of a land disturbing activity.
- The Project Authority for preconstruction (design) activities is typically the PM, Residency CA, RA or other such person responsible for the preconstruction phase of the land disturbing activity. This person shall ensure that the proposed ESC Plan has been reviewed and approved by a DEQ Certified Plan Reviewer.
- The Project Authority for actual land disturbance (construction) activities is typically the ACE, RA or other such person responsible for the construction phase of the land disturbing activity. This person shall ensure that the RLDA has an assigned DEQ Certified RLD and that the implementation of the ESC Plan, including inspection requirements, is being overseen/conducted by a DEQ Certified Inspector.

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10.2.2.2 VDOT Training/Certifications

Where land disturbing activities occurring within VDOT right of way are regulated under the Virginia ESC Law and Regulations, Section 107.16(a) of the 2016 VDOT R&B Specifications requires that all contractors performing such land disturbing activities have a person certified by the VDOT in erosion and sediment control within the project limits. This certification requirement is mandatory for all contractors performing land disturbing activities under contracts managed by VDOT, including PPTA and Design Build agreements. For contractors performing land disturbing activities on VDOT right of way under a Land Use Permit, the certification requirements of Section 107.16(a) shall apply if the area of land disturbance within the VDOT right of way exceeds that noted in Sections 10.2.2 and 10.2.2.3* of this document.

EXCEPTION – Those contractors performing maintenance related land disturbing activities under a hired equipment contract whose work is directly supervised by VDOT personnel.

- Successful completion of the Department’s “Erosion and Sediment Control Contractor Certification” course satisfies the certification requirements of Section 107.16 (a) of the 2016 VDOT R&B Specifications.
- The ESCCC is a joint training effort between the VDOT and the VTCA. The VDOT develops the course material and the VTCA administers the training, testing and issuance of certifications.

The VDOT “In Stream Maintenance Training” course is required training for all VDOT personnel performing or supervising maintenance activities, where such activities are regulated under the Virginia ESC Law and Regulations.

- The “In Stream Maintenance Training” course is developed and administered by the VDOT’s Central Office Environmental Division.
- The “In Stream Maintenance Training” course consists of several modules that are targeted toward best management practices for working in and around streams and other environmentally sensitive areas and controlling erosion and sedimentation associated with land disturbance on maintenance activities.

The “In Stream Maintenance Training” course is designed to be conducted at the local level (i.e., Residency, Area Maintenance Headquarters, etc.) by the Residency Environmental Specialist or other such person. The modules can be taught individually in short group meetings or several modules can be combined and taught at a more formal training session. A web based training option is available in the VDOT University Virtual Campus.

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10.2.2.3 Policy/General Guidelines*

Requirements of the Virginia ESC Regulations and the VDOT ESC Standards and Specifications, as approved by the DEQ and described herein, shall be incorporated into all erosion and sediment control designs and shall be enforced on all Regulated Land Disturbance Activities managed by VDOT.

When requested by DEQ, and where deemed practical by VDOT, projects located in jurisdictions with more stringent ESC technical criteria than that contained in the Virginia ESC Law and Regulations shall be designed to meet the more stringent criteria. The local criteria may be part of a locally adopted State approved program or may be part of a watershed initiative related to the protection of a water supply, a TMDL implementation plan. It will be the responsibility of the ESC Plan Designer to demonstrate, through appropriate analysis and documentation, that the local requirements are not practical for the project under consideration. Early coordination should occur between the ESC Plan Designer and the local ESC program authority in order to identify any such requirements.

Any maintenance or construction activity disturbing 2,500 square feet (232 m^2) or greater within the area of Tidewater, Virginia, as defined in the Virginia Chesapeake Bay Preservation Act, must have a project specific ESC Plan developed and implemented in accordance with the VDOT's Approved ESC Standards and Specifications. Tidewater, Virginia is defined as the Counties of Accomack, Arlington, Caroline, Charles City, Chesterfield, Essex, Fairfax, Gloucester, Hanover, Henrico, Isle of Wight, James City, King George, King and Queen, King William, Lancaster, Matthews, Middlesex, New Kent, Northampton, Northumberland, Prince George, Prince William, Richmond, Spotsylvania, Stafford, Surry, Westmoreland and York and the Cities of Alexandria, Chesapeake, Colonial Heights, Fairfax, Falls Church, Fredericksburg, Hampton, Hopewell, Newport News, Norfolk, Petersburg, Poquoson, Portsmouth, Richmond, Suffolk, Virginia Beach and Williamsburg.

Any maintenance or construction activity disturbing 10,000 square feet (929 m^2) or greater in areas other than those within Tidewater, Virginia must have a project specific ESC Plan developed and implemented in accordance with VDOT's Approved ESC Standards and Specifications.

The Virginia ESC Law defines land disturbance as any land change which may result in soil erosion from water or wind and the movement of sediments into state waters or onto lands of the Commonwealth, including, but not limited to, clearing, grading, excavating, transporting and filling of land.

The blading/dragging/grading associated with the maintenance of the travel surface of an unpaved roadway is considered a land disturbance.

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VDOT shall be responsible for ensuring compliance with its approved ESC Standards and Specifications by private entities (i.e., agents, contractors, subcontractors, consultants) conducting regulated land disturbance activities on projects managed by VDOT, including those constructed under the Public/Private Transportation Act (PPTA), the Design/Build process and the Capital Outlay Program.

When not included in the proposed ESC Plan for the RLDA, the contractor must provide an ESC Plan in accordance with Section 106 of the 2016* VDOT R&B Specifications for borrow pit sites and disposal area sites utilized exclusively to obtain or dispose of project materials. Any such ESC Plan provided by the contractor must comply with VDOT's Approved ESC Standards and Specifications. Where required, the contractor must design, construct and maintain sediment traps and/or basins at these sites. The contractor shall supply supporting calculations for sediment trap and/or basin design and calculations demonstrating compliance with the Virginia ESC Regulation MS-19 for an adequate receiving channel. All information provided by the contractor should be reviewed by the District Hydraulics Engineer or other appropriate VDOT personnel to ensure accuracy, the use of appropriate methodology and compliance with VDOT's Approved ESC Standards and Specifications, Virginia ESC Law and Regulations, and VPDES Construction Permit Conditions (where applicable).

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10.3 Documentation

10.3.1 Design Documentation

Drainage designers should use the guidelines and checklists such as those provided in the Virginia Erosion and Sediment Control Handbook (VESCH) to verify that critical design issues have been accounted for with each design phase of the project.

The design of sediment traps, sediment basins and other major erosion and sediment control measures is to be supported by engineering calculations which are to be included as a part of the project's drainage report. Instruction for designing erosion and sediment control measures can be found in Appendix 10B-1 and the VESCH.

10.3.1.1 Minimum Requirements for All ESC Plans*

The ESC Plan shall include a plan view depicting (using appropriate plan symbols and notes) locations where specific measures are needed in order to control erosion and sediment deposition within the RLDA limits. Specific erosion and sediment control measures include, but are not limited to, protective linings for ditches and steep slopes, pipe outlet protection, silt fence, check dams, sediment traps, sediment basins, diversion berms and ditches, etc. The ESC Plan should be based on the existing field conditions at the time of design, the anticipated sequence of construction, and the site conditions expected as the RLDA is brought to final grade.

Erosion and Sediment Control Plan Information: General information related to the ESC Plan is to be documented utilizing the notes in Section I, II and III of the SWPPP General Information Sheets. Information required to complete the SWPPP notes will be developed by the ESC Plan Designer with assistance from District Hydraulics or Residency staff as needed.

Sequence of Construction: The proposed ESC Plan shall be developed in conjunction with the proposed Sequence of Construction Plan and should denote the required erosion and sediment controls for the intended sequence of major construction activities. In planning the sequence of construction, consideration should be given to elimination or minimization of the need for major erosion and sediment control facilities, such as sediment basins, by strategic planning of the construction timing and location of erosion and sediment control measures, grading operations, temporary and permanent channels and drainage facilities. Any changes to the proposed sequence of construction plan that could potentially cause a significant change to the proposed ESC or related Drainage Plan shall be submitted to the ESC Plan Designer/Hydraulics Engineer for evaluation of impacts.

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10.3 – Documentation

Contents of ESC Plan: Details of the RLDA'S ESC Plan may be shown on, but is not limited to, the plan, profile, typical section and detail sheets of the construction plan set or other such documents. The ESC Plan shall, at a minimum, contain the following information: *

- Section I, II and III notes of the SWPPP General Information Sheets.
- Limits of clearing and grading (plan view and typical section).
- Location of temporary and permanent erosion and sediment control and related permanent stormwater management features (plan view).
- Construction details for any temporary or permanent erosion and sediment control or related permanent stormwater management features if different from the VDOT R&B Standards and Specifications.
- Location of any surface waters, wetland features, or other environmentally sensitive/critical areas within or immediately adjacent to the RLDA area. (Such features located within close proximity of the project, yet outside the limits of the construction plans or other such documents, shall be described in Note 6 in Section I of the SWPPP General Information Sheets.
- Appropriate existing and proposed topographic features.

10.3.1.2 ESC Plan Development Process

Concurrent Engineering Process for Plan Development (CEP)

The CEP for plan development incorporates the principles of teamwork, flexibility, and milestones. The development, review, and approval of the project specific erosion and sediment control plan is included in the CEP milestones as follows:

- Scoping Stage: The ESC Plan Designer/Hydraulics Engineer shall identify any local ESC or related SWM technical criteria or watershed initiatives that may influence the ESC or related post construction SWM design of the project. This should include early coordination with the local ESC/SWM program authority to assess any potential impacts on the project design.
- PFI/Public Hearing Stage: The ESC Plan Designer/Hydraulics Engineer shall develop preliminary ESC and associated post construction SWM Plans (see the latest version of IIM-LD-195 for information on the technical criteria and requirements for permanent SWM facilities) and show locations of all major erosion and sediment control, permanent stormwater management, and/or drainage facilities

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on the plans that may affect the required right of way. Members of the project team shall provide comments, as appropriate, to the ESC Plan Designer/Hydraulics Engineer regarding the preliminary plan, including any pertinent information that might affect the final design of the ESC or post construction SWM Plan.

- **FI Stage:** Prior to the FI, the ESC Plan Designer/Hydraulics Engineer shall develop final ESC and associated post construction SWM plans and show final design locations, sizes, and other plan details as necessary to accurately determine the right-of-way and/or easement requirements, and to determine whether the selected ESC Plan Concept (Single or Multiple Phase^{*}) is appropriate. The ESC and related post construction SWM Plan design shall address any comments or recommendations from the Public Hearing process as accepted/incorporated by the Project Manager (or other such project authority). This phase of the ESC and related post construction SWM Plan design process provides all the necessary information needed to conduct a thorough Field Inspection. Members of the project team shall provide comments, as appropriate, to the ESC Plan Designer/Hydraulics Engineer regarding the proposed ESC and post construction SWM Plan.
- **ESC Plan Design Completion:** After FI and prior to the Right of Way stage, the ESC Plan Designer/Hydraulics Engineer shall incorporate all changes, deletions, and/or additions into the ESC and related post construction SWM Plan resulting from any FI and/or Quality Control Review comments or plan revisions. The ESC and post construction SWM Plan shall be carefully reviewed for compliance with the approved VDOT ESC and SWM Standards and Specifications and the VPDES Construction Permit (where applicable) including, but not limited to, the types of proposed measures, means of access for maintenance, and required right of way and/or easements.
- **ESC & SWM Plan Design Certification:** Prior to the Pre-Advertisement Conference (or similar project meeting), the ESC Plan Designer/Hydraulics Engineer shall have the ESC and related post construction SWM Plan reviewed by a DEQ Certified ESC Plan Reviewer. The ECS Plan Reviewer shall verify that the ESC and related post construction SWM Plan for the project is in compliance with the VDOT Approved ESC and SWM Standards and Specifications. Any comments by the Plan Reviewer shall be addressed with the ESC Plan Designer/Hydraulics Engineer. Once all comments have been reconciled, the ESC Plan Reviewer completes, signs and forwards the ESC & SWM Plan Design Certification Form (LD-445C) to the ESC Plan Designer/Hydraulics Engineer. The ESC Plan Designer/Hydraulics Engineer provides the completed LD-445C form to the Project Manager (or other such project authority) for use in the VPDES Construction Permit Application Process (see the latest version of IIM-LD-242), if applicable. A copy of the completed LD-445C form is to be retained with the other documentation for the proposed ESC Plan.

Plan Development Process for “No Plan” Projects and Special Advertisement and Award Process (SAAP) Projects

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- A “No Plan” project is defined as an assembly of letter size sketches and narratives depicting the project’s location, typical cross section, estimated quantities and any other specific details necessary (i.e., ESC and/or post construction SWM plans) for the construction of the project. Any “No Plan” project that disturbs 2,500 square feet (232 m²) or greater in Tidewater, Virginia or 10,000 square feet (929 m²) or greater elsewhere within the State must have a project specific ESC Plan. A project developed under the “No Plan” concept is one that generally requires little or no survey, engineering or hydraulic analysis in order to produce the necessary contract documents. Any required right of way is generally acquired through donations in lieu of the purchase/condemnation process. See Appendix A of the *VDOT Road Design Manual* for additional information on the “No Plan” concept.
- “SAAP” Projects are defined as those advertised under the Special Advertisement and Award Process. The “No Plan” concept is generally used to produce the required contract documents. “SAAP” projects generally have one or more of the following characteristics:
 - They require little or no preliminary engineering.
 - They are standard maintenance repair contracts (e.g., bridge, guardrail or concrete pavement repairs).
 - They are standard incidental construction and/or improvement projects of limited scope.
 - The work being performed involves a singular function or specialty work (e.g., bridge painting, pavement markings or pipe installation).

Any “SAAP” project that disturbs 2,500 square feet (232 m²) or greater in Tidewater, Virginia or 10,000 square feet (929 m²) or greater elsewhere within the State must have a project specific ESC Plan.

- During the early stages of the preparation of the contract assembly for any “SAAP” or “No Plan” Project, the Contract Administrator (CA) (or other such project authority) should conduct a Scoping Meeting to determine what is needed on the project in order to comply with the VDOT Approved ESC and SWM Standards and Specifications.

The Scoping Meeting should include the CA, the District L&D Engineer and/or Hydraulics Engineer, and the appropriate District Environmental Section personnel in order to accurately determine the project requirements.

- The CA, with the assistance of the District Hydraulics Engineer, or other appropriately qualified personnel, shall prepare a preliminary Straight Line Sketch (SLS). An example is shown in Appendix 10C-1.*

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- Upon completion of the Preliminary SLS, the CA shall coordinate with the appropriate personnel in the District Hydraulics Section and other appropriate District/Residency sections to schedule a Field Review. The following data should be made available to all Field Review participants:
 - A Vicinity Map – United States Geological Survey (USGS) Topographical Map and County Road Map showing the location and limits of the proposed project.
 - A SLS of the project showing the project limits and the approximate location of proposed drainage items and erosion and sediment control items.
- If during the Field Review it is found that such items as permanent stormwater management facilities, drainage improvements, temporary sediment basins or temporary sediment traps are required, the District Hydraulics Section will determine and request the necessary survey data, and provide engineering support in the development of the SLS to ensure consistency with the VDOT Approved ESC and SWM Standards and Specifications.
- Upon completion of the design of any required permanent stormwater management facilities, drainage improvements, or sediment trapping facilities, the District Hydraulics Section will provide the CA with final comments, recommendations and plan details.
- Final approval of the SLS:
 - ⊖ Upon incorporation of all the required revisions, a DEQ Certified ESC Plan Reviewer shall make a final review of the ESC and post construction SWM Plan (if applicable). Once any Plan Reviewer comments have been reconciled with the ESC Plan Designer/Hydraulics Engineer, the Plan Reviewer shall complete and sign the LD-445C Erosion and Sediment Control and Stormwater Management Certification form and forward it to the CA for use in the VPDES Construction Permit Application Process (see the latest version of IIM-LD-242), if applicable. A copy of the completed LD-445C form is to be retained with the other documentation for the proposed ESC Plan.
 - The CA will incorporate the final SLS into the contract assembly.
 - Thereafter, any significant change to the project that may impact the ESC, post construction SWM, or Drainage Plan will require resubmission of the revised SLS to the ESC Plan Designer and/or District Hydraulics Engineer for review and approval prior to implementation.
- The final version of the SLS, the SWPPP General Information and any Construction Notes will serve as the ESC and post construction SWM Plan for the project. During the construction phase of the project, a copy of the ESC and post construction SWM

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Plan (Record Set) and all other SWPPP documents shall be kept on the project site and in the project file at the appropriate District/Residency Office as documentation that all policies and procedures have been addressed with regards to the post construction SWM, ESC and SWPPP requirements of the project. During construction, any authorized changes to the proposed ESC Plan necessitated by unforeseen conditions or other circumstances shall be documented on the Record Set in accordance with Section 107.16(e) of the 2016* VDOT R&B Specifications.

Plan Development Process for State Force Construction Projects

- State Force Construction Projects include land-disturbing activities that are performed with state force equipment and/or hired equipment.
- Residency personnel are to contact the Residency Environmental Specialist and/or the District Hydraulics Engineer to review any State Force Construction Projects to determine if the proposed work is of a magnitude that may require drainage improvements, an ESC Plan, a post construction SWM Plan, and/or a SWPPP. If it is determined that any of these items are needed, the same procedures outlined in this document shall be followed.

Plan Development Process for Minimum Plan and Standard Plan Construction Projects

- Minimum Plan projects are those that require a limited amount of survey information in order to perform the necessary engineering studies and to provide the information required to secure the necessary rights of way. The minimum amounts of detail needed to address environmental requirements and to construct the project are provided in a standard plan assembly format. See Appendix A of the *VDOT Road Design Manual* for additional information on the Minimum Plan concept.
- Standard Plan Projects are those that require complete survey information in order to perform the necessary detailed engineering studies and to develop a complete and detailed construction plan assembly.
- Projects developed under the Minimum and Standard Plan concepts must have an ESC plan and a SWPPP if they exceed the land disturbance threshold amounts noted in Section 10.2.2.3 of this document. In addition, such projects may also require a post construction SWM Plan (see the latest version of IIM-LD-195 for applicability and technical criteria and requirements). These plan assemblies should be developed consistent with the steps identified under the Concurrent Engineering Plan Development process described in Section 10.3.1.2 of this document.

The ESC Plan shall be developed utilizing either a single phase or a multiple phase concept. The decision as to which concept to use in the development of the ESC Plan for each specific RLDA shall be determined by the ESC Plan Designer/Hydraulics

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Engineer and the Project Manager (or other such project authority) during the initial stages of plan development.

- Single Phase ESC Plan Concept
 - The Single Phase ESC Plan concept may be used on minor construction projects where all of the erosion and sediment control measures can be clearly depicted on the construction plan sheet (e.g., rural secondary project, minor urban widening project, bridge and approach project, etc.)
 - The ESC Plan shall address both those items requiring installation prior to the beginning of grubbing operations or the installation of major drainage structures and those items to be installed as grading operations and installation of minor drainage facilities progress. The ESC Plan shall contain or be accompanied by, at a minimum, all those items identified in Section 10.3.1.1* of this document (Contents of an ESC Plan).
 - In addition to standard plan symbols, supplemental notes/narratives may be used to clearly define the intent and purpose of the proposed erosion and sediment control measures and to define their sequence of installation. Some standard construction notes and symbols have been developed and are included as a part of the VDOT CADD Cell and Custom Line Style Library and the Geopak Road Plan View Labeler.
- Multiple Phase ESC Plan Concept
 - The Multiple Phase ESC Plan concept shall be used on construction projects where additional plan sheet(s) are needed in order to clearly depict the erosion and sediment control measures required at the various stages of construction (e.g., rural multi-lane roadway projects, major urban roadway projects, roadway projects on new locations, roadway projects through environmentally sensitive areas, etc.).
 - In addition to standard plan symbols, supplemental notes/narratives may be used to clearly define the intent and purpose of the proposed erosion and sediment control measures and to define their installation sequencing. Some standard construction notes and symbols have been developed and are included as a part of the VDOT CADD Cell and Custom Line Style Library and the Geopak Road Plan View Labeler.
 - Projects may be developed using the Multiple Phase concept on only those portions of the project that require greater detail and clarity than that provided by the Single Phase concept (e.g., construction in environmentally sensitive areas or major waterway areas, areas where plan clutter reduces the ability to clearly show the erosion and sediment control items, and where grading operations are

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required prior to installation of major temporary ESC measures or permanent drainage improvements).

- At a minimum, the multiple phase ESC Plan should be developed in two phases:
 - Phase I for those items that need to be installed prior to the beginning of grubbing operations or the installation of major drainage structures.
 - Phase II for those items that need to be installed as grading operations and installation of minor drainage facilities progress.
- Projects with complex grading operations and/or sequence of construction plans may warrant additional ESC Plan Phases to clearly identify all required ESC items.
- Generally, the Phase I and the Phase II plan details (including associated narratives or notes) should each be depicted on a separate plan sheet following the applicable construction plan sheet (e.g., Construction Plan Sheet 5, Profile Sheet 5A, ESC Phase I Plan Sheet 5B, ESC Phase II Plan Sheet 5C).
- When found appropriate, the Phase I and Phase II plan details may be depicted on a single plan sheet following the applicable construction plan sheet (e.g., Construction Plan Sheet 5, Profile Sheet 5A, ESC Phase I & II Plan Sheet 5B).
- In general, when utilizing a separate plan sheet for the Phase I and the Phase II plan details, erosion and sediment control items (including protective linings in permanent ditches and channel relocations) depicted on the Phase I Plan Sheet should not be duplicated on the Phase II Plan Sheet. Temporary erosion and sediment control items depicted on the Phase I & II Plan Sheets should not be duplicated on the Construction Plan Sheet. Permanent drainage improvements identified for completion in Phase I, such as culverts, channels, etc, should also be shown on the Phase II plan.
- The ESC Phase I Plan Sheet shall, at a minimum, depict the following:
 - Existing contours and appropriate existing hydraulic and topographic features as referenced in the Survey File.
 - Proposed centerline, edges of pavement and construction limits.
 - Permanent drainage culverts, temporary diversion channels and permanent channel relocations (including any protective linings required) involving natural drainage ways that would be constructed or installed prior to the start of grading operations.*
 - Temporary Sediment Basins (including grading contours, if applicable) that are to be constructed in the initial phases of the grading operations.

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- Permanent stormwater management basins (including grading contours, if applicable) that will be utilized as temporary sediment basins and that are to be constructed in the initial phases of the grading operations.
 - Diversion dikes, berm ditches and other perimeter ditches (including any required protective linings) that need to be installed prior to the start of grubbing or other earth moving operations.
 - Temporary sediment traps, silt fences, rock check dams, turbidity curtains and any other perimeter controls that need to be installed prior to the start of grubbing or other earth moving operations.
 - Any necessary construction notes/narratives (to include the need/location for items not typically shown on the plan view such as temporary slope drains, construction entrances, etc.).
- The Phase II Plan Sheet shall, at a minimum, depict the following:
- Proposed centerline, edges of pavement and construction limits.
 - Any permanent drainage culverts and channel relocations involving natural drainage ways installed under the Phase I Plan.
 - Temporary sediment basins and permanent stormwater management basins installed under the Phase I Plan.
 - All culverts, storm sewer pipe, drop inlets and associated drainage structures that will be installed as grading operations progress.
 - All required protective ditch linings (e.g., Standard Rolled Erosion Control Product (RECP) Temporary or Rolled Erosion Control Product (RECP) Permanent, concrete, riprap, etc.), paved flumes and associated structures that will be installed as grading operations progress.
 - Temporary sediment traps, silt fences, rock check dams, drop inlet silt traps, and any other erosion and sediment control measures needed to be installed as grading operations progress.
 - Any necessary construction notes/narratives (to include the need/location for items not typically shown on the plan view such as temporary slope drains, construction entrances, etc.).
- The following drainage items from the Phase I and II Plan Sheets shall be depicted on the Construction Plan Sheet:
- Permanent drainage culverts, storm sewer systems, drop inlets and associated structures.
 - Permanent channel relocations involving natural waterways.
 - Permanent stormwater management facilities.
 - Rock checkdams that will be left in place after construction to serve as a permanent stormwater management structure.*

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10.3.1.3 SWPPP Applicability and Requirements

A SWPPP identifies potential sources of pollutants which may reasonably be expected to affect the stormwater discharges from the RLDA, and any support areas included in the VPDES Construction Permit coverage for the RLDA, and describes and ensures the implementation of practices to minimize pollutants in such discharges. For the purposes of this document*, the RLDA is defined as the proposed construction or maintenance related land disturbing project or activity that generates the need for acquiring coverage under the VPDES Construction Permit and/or requires an ESC Plan.

The required contents of a SWPPP for those land disturbance activities requiring coverage under the VPDES Construction Permit are found in Part II of the General Permit section of the VPDES Regulations (9VAC25-880-70).

Except for the items dealing with the post construction stormwater management requirements, the majority of the items that must be addressed in the SWPPP for land disturbance activities requiring VPDES Construction Permit coverage must also be addressed for those land disturbance activities that do not require VPDES Construction Permit coverage but do require an ESC Plan in accordance with the requirements of the Virginia ESC Law and Regulations.

When the land disturbing activity requires coverage under the VPDES Construction Permit, the SWPPP must also include a copy of the VPDES Construction Permit, the VPDES Construction Permit Registration Information form LD-445, the VPDES Construction Permit Contact Information form LD-445A, the SWPPP Certification form LD-445E and the VPDES Construction Permit coverage letter received from DEQ showing a project specific permit number.

The SWPPP for the RLDA is to include any onsite support facilities used exclusively for the RLDA (e.g., borrow and disposal sites, the contractor's storage and fueling areas, etc.) (see the current version of IIM-LD-242 for guidance related to SWPPP information for support facilities).

For those RLDAs requiring coverage under the VPDES Construction Permit, Part II A.8 of the General Permit section of the VPDES Regulations (9VAC25-880-70) requires the SWPPP to be signed by a person so identified in Part III K.2 of that same document. For a State Agency, that person is the principal executive officer or his designee. For VDOT projects, that authority has been delegated to the RLD for each specific RLDA.

Many of the items required in the SWPPP are inherently contained in the construction plans (or other such documents) by means of the erosion and sediment control plans and the post construction stormwater management plans and in other VDOT documents such as the R&B Standards and Specifications, which can be incorporated into the SWPPP by reference.

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10.3.1.4 Form LD-445E

For those land disturbing activities requiring coverage under the VPDES Construction Permit, the Construction Permit requires that the SWPPP for any support facilities be included in the permit coverage for the RLDA be developed and included with the SWPPP for the RLDA prior to issuance of permit coverage.

On most VDOT land disturbing activities, it is the responsibility of the contractor or other such person performing the land disturbance activity to identify the location of the support facilities and provide the SWPPP for such to the RLD, District Drainage Engineer and District VPDES Coordinator for review and approval (see the current version of IIM-LD-242* for further discussion on support facilities).

Since the VPDES Construction Permit coverage for VDOT RLDAs is normally obtained prior to the identification of the support areas, a mechanism is required whereby the project files can be documented, and DEQ can be assured, that all of the information for the support facilities, as well as other required information not available at the time the VPDES Construction Permit coverage for the RLDA is applied for, has been, or will be, included in the SWPPP for the RLDA. The mechanism to be used for this purpose will be SWPPP Certification form LD-445E.

- Form LD-445E is also to be used to identify the VDOT person responsible for the inspection of the erosion and sediment control facilities.
- The DEQ has approved the signature of the RLD on the LD-445E form as meeting the SWPPP signatory requirements contained in Part II A.8 of the General Permit section of the VPDES Regulations (9VAC25-880-70).
- Form LD-445E is to be completed by the VDOT RLD for all land disturbing activities requiring VPDES Construction Permit Coverage.
- A copy of completed form LD-445E is to be retained with the other SWPPP documents for the RLDA.
- For those land disturbing activities requiring coverage under the VPDES Construction Permit, the VDOT RLD is to send the completed LD-445E form to the District VPDES Construction Permit Coordinator for inclusion with other VPDES Construction Permit data that is submitted monthly to the Central Office VPDES Construction Permit Coordinator.

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10.3.1.5 SWPPP General Information Sheets

In order to provide a clear understanding of what is required in a SWPPP and to provide a reference as to where those items are located within the contract/construction documents, a set of SWPPP General Information Sheets has been developed. The SWPPP General Information Sheets provide a summary of the information required in Part II^{*} of the General Permit section of the VPDES Regulations (9VAC25-880-70) and, where not included on the General Information Sheets, provide a reference to where that information can be found within the contract/construction documents for the RLDA (e.g., the construction plans or other such documents, the VDOT R&B Standards and/or Specifications, contractor supplied documents, etc.).

The SWPPP General Information Sheets incorporate many of the notes previously included in the ESC General Notes as well as those necessary to identify and describe the post construction stormwater management plan for the RLDA (if applicable).

The SWPPP General Information Sheets are to be included in the construction plan set (or other such documents) for all land disturbance activities requiring VPDES Construction Permit coverage and/or an erosion and sediment control plan. Completion and inclusion of the SWPPP General Information Sheets in the contract documents satisfies one of the many requirements contained in the VPDES Construction Permit. Those persons who oversee or perform activities covered by the VPDES Construction Permit must review and understand all of the conditions and requirements contained within that permit.

The SWPPP General Information Sheets are updated from time to time to clarify and/or include additional requirements as a result of changes to the VPDES Regulation, the VPDES Construction Permit or VDOT's Approved ESC and SWM Standards and Specifications. Prior to finalization of the construction plans or other such documents for a proposed land disturbance activity, the Project Manager or other such project authority is to verify that the most recent SWPPP General Information Sheets are included.

The SWPPP General Information Sheets have been developed in two formats as follows:

- Available in the CADD 2000sheet.cel and 2015sheet.cel cell libraries (referenced as SWPPP1, SWPPP2 & SWPPP3) for use with those land disturbance activities that have a formal set of construction plans (i.e., those developed under a Minimum (M) Plan or Complete (C) Plan Process).
- Available in Falcon under the Engineering Services' eng-ser directory (No Plan sub-directory) as an 8.5" X 11" letter size WORD document.

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The SWPPP General Information Sheets are to be completed by the ESC Plan Designer, the Hydraulic Engineer or other such person who has the responsibility for developing the ESC and post construction SWM Plan (if applicable) for the RLDA.

Information required by those notes on the SWPPP General Information Sheets designated with an asterisk is to be developed / provided by the VDOT RLD. Information required by those notes on the SWPPP General Information Sheets designated with a double asterisk is to be provided / completed by the contractor.

All information/notes in Sections I through VI of the SWPPP General Information Sheets are applicable to land disturbance activities requiring coverage under the VPDES Construction Permit.

For land disturbance activities requiring an ESC Plan but exempt from the VPDES Regulations or the need for coverage under the VPDES Construction Permit, the information noted on the SWPPP General Information Sheets in Section IV and Section VI, is, typically, not applicable. Those sections, as well as any other notes/information in other sections of the SWPPP General Information Sheets not applicable to a specific land disturbance activity should be deleted, struck through or noted as “NA” (i.e., not applicable to the land disturbance activity).

The permanent BMP information (when applicable) in Section VI is to be completed by the Hydraulic Engineer (or other such person developing the post construction SWM Plan) and is to be based on the pre-construction design. This information is to be updated when any changes to the post construction SWM Plan are authorized during the construction phase of the activity. Such changes are to be made as a formal revision to the plans. When submitting a request for termination of the VPDES Construction Permit coverage, the RLD is to use the information in the Permanent BMP table(s) in completing the BMP information section on form LD-445D.

Some of the notes on the General Information Sheets require project specific user input. Some examples of the information required are as follows:

- Section I General^{*}
 - Note 1 - Activity Description (Examples)
 - This roadway construction project consists of adding two additional parallel lanes to an existing two lane rural roadway facility.
 - This roadway construction project consists of improving an existing urban roadway intersection by adding left turn and right turn lanes.

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- This roadway construction project consists of replacement of an existing bridge with a new bridge and improvements to the existing roadway approaches.
- This roadway construction project consists of widening an existing urban street and adding additional turn lanes.
- This roadway maintenance project consists of re-grading and enlarging the roadside ditches and replacing drainage pipes along an existing rural roadway.
- This roadway maintenance project consists of re-grading the roadside ditches and replacing deteriorated drainage pipes along an existing rural roadway in order to reestablish original grade and/or hydraulic capacity.
- .

- Section II Erosion and Sediment Control

- Note 1 - Variances (Example)

- A variance to decrease the height of silt fence to 26" approved by letter from the Department of Environmental Quality's Piedmont Regional Office dated July 15, 2013.

10.3.1.6 SWPPP Documents^{*}

For VDOT RLDAs, the required documents for a SWPPP shall include, but are not limited to, the following:

- The construction plans/documents.
- The SWPPP General Information Sheets (with all notes completed with appropriate information).
- The ESC Plan.
- The post construction SWM Plan (if applicable).
- The VDOT R&B Standards and Specifications, Supplemental Specifications, Special Provisions and Special Provision Copied Notes.
- A copy of the VPDES General Permit for Discharges of Stormwater from Construction Activities (the Construction Permit) (when applicable).
- A copy of the VPDES Construction Permit coverage letter received from DEQ (when applicable).

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- A copy of the VPDES Construction Permit Registration Information form LD-445, (when applicable).
- A copy of the SWPPP Certification form LD-445E.
- Documents required to be developed/provided by the contractor for erosion and sediment control and stormwater pollution prevention associated with any support facilities to be included in the VPDES Construction Permit coverage for the RLDA.
- All ESC inspection reports.
- All ESC and SWM design computations and supporting data.
- A Record Set of Plans (see Section 10.3.1.7 of this document* for more information)

All documents related to the SWPPP for a RLDA (except for the ESC and SWM design computations and supporting data) shall be maintained at the activity site and shall be readily available for use by those with SWPPP implementation responsibilities. All documents related to the SWPPP for a RLDA shall be readily available for review by others upon request during normal working business hours. SWPPP related information not included in the construction plans/documents, the VDOT R&B Standards, Specifications, Supplemental Specifications, Special Provisions or Special Provision Copied Notes and the ESC and SWM design computation files is to be kept in a designated separate paper and/or electronic file. Where no facilities are available at the activity site to maintain the SWPPP documents, they are to be kept at a location convenient to the activity site where they will be readily available for use by those with SWPPP implementation responsibilities and would be available for review by others upon request during normal business working hours.

Where the SWPPP documents are not stored on site, a copy of such documents, except for the ESC and SWM engineering calculations and documentation, shall be in the possession of those with day to day operational control over the implementation of the SWPPP (e.g. the VDOT RDL, the VDOT ESC Inspector, the contractor's ESCCC person, etc.) whenever they are on site.

10.3.1.7 SWPPP Components

The following list outlines the major components of a SWPPP, the person(s) responsible for ensuring that the component is addressed in the SWPPP for a RLDA and how that component is addressed in the construction plans or other such documents for a VDOT land disturbing activity.

- A copy of the VPDES Construction Permit registration statement, permit coverage letter and LD-445A are to be posted at the construction site.
 - The RLD ensures that a copy of the VPDES Construction Permit Registration Information form LD-445, a copy of the SWPPP Certification form LD-445E and

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the VPDES Construction Permit coverage letter received from DEQ is maintained in the SWPPP file for the RLDA.

- A copy the VPDES Construction Permit (when applicable).
 - The RLD ensures that a copy is maintained in the SWPPP file for the RLDA. A copy of the VPDES Construction Permit can be obtained at: <http://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/CGP2014.pdf>
- A narrative description of the nature of the construction activity, including the function of the project.
 - The ESC Plan Designer incorporates project specific information into the appropriate note(s) on the SWPPP General Information Sheets for the RLDA.
- The intended sequence and timing of activities that disturb soils at the site (e.g., grubbing, excavation, grading, utilities and infrastructure installation).
 - The Contractor or other such person develops/provides project specific information. The RLD ensures that the information is maintained in the SWPPP file for the RLDA.
- A record of the dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated.
 - The Contractor or other such person develops/provides project specific information. The RLD ensures that the information is maintained in the SWPPP file for the RLDA.
- Estimates of the total area expected to be disturbed by excavation, grading, or other construction activities.
 - The ESC Plan Designer obtains the information and incorporates it into the appropriate note on the SWPPP General Information Sheets for the RLDA.
- A description of any other potential pollutant sources, such as vehicle fueling, storage of fertilizers or chemicals, sanitary waste facilities, etc.
 - The Contractor or other such person develops/provides project specific information. The RLD ensures that the information is maintained in the SWPPP file for the RLDA.
- Identification of the nearest receiving waters at or near the construction site that will receive discharges from disturbed areas of the RLDA.
 - The ESC Plan Designer determines the information and incorporates it into the appropriate note on the SWPPP General Information Sheets for the RLDA.
- The location and description of any discharge associated with industrial activity other than construction at the site. This includes stormwater discharges from dedicated asphalt plants and dedicated concrete plants that are covered by the VPDES Construction Permit for the RLDA.

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- This information is covered by a standard note on the SWPPP General Information Sheets.
- A legible site map/plan identifying the following items:
 - Directions of stormwater flow and approximate slopes anticipated after major grading activities.
 - The ESC Plan Designer ensures that the appropriate information (e.g., grading contours, typical sections, profiles and/or cross sections) is included in the construction plans or other such documents for the RLDA.
 - Areas of soil disturbance and areas of the site which will not be disturbed.
 - The ESC Plan Designer ensures that the appropriate information (e.g., plan view construction limits and/or typical sections/cross sections) is included in the construction plans or other such documents for the RLDA.
 - Locations of major structural and nonstructural control measures identified in the SWPPP, including those that will be permanent after construction activities have been completed.
 - The ESC Plan Designer ensures that the appropriate information is included in the construction plans or other such documents for the RLDA.
 - Locations where stabilization practices are expected to occur.
 - The ESC Plan Designer ensures that the appropriate information (e.g., plan view construction limits and/or typical sections/cross sections) is included in the construction plans or other such documents for the RLDA.
 - Locations of surface waters.*
 - The ESC Plan Designer ensures that the appropriate information is included in the construction plans or other such documents for the RLDA.
 - Locations where concentrated stormwater discharges from the construction site.
 - The ESC Plan Designer ensures that the appropriate information is included in the construction plans or other such documents for the RLDA.
 - Locations of any support areas (e.g., material, waste, borrow or equipment storage areas) that are to be included in the permit coverage and the SWPPP for the RLDA.
 - The Contractor or other such person provides project specific information. The designated RLD ensures that the information is maintained in the SWPPP file for the RLDA.
 - Locations of other potential pollutant sources, such as vehicle fueling, storage of chemicals, concrete wash-out areas, sanitary waste facilities, including those temporarily placed on the construction site, etc.
 - The Contractor or other such person provides project specific information. The designated RLD ensures that the information is maintained in the SWPPP file for the RLDA.
 - Areas where final stabilization has been accomplished.

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- The Contractor or other such person provides project specific information. The designated RLD ensures that the information is maintained in the SWPPP file for the RLDA.
- The SWPPP shall include a description of all control measures that will be implemented as part of the construction activity to minimize pollutants in stormwater discharges. For each major construction activity identified, the SWPPP shall clearly describe appropriate control measures, the general sequencing during the construction process in which the control measures will be implemented, and which operator (i.e., contractor) is responsible for implementation of the control measure.
 - The ESC Plan Designer/Hydraulics Engineer develops the ESC Plan and the SWPPP for inclusion in the construction plans/documents for the RLDA. The Contractor or other such person develops/provides proposed revisions to the ESC Plan and the SWPPP as necessary to meet differing field conditions or construction sequencing. The VDOT ESC Inspector reviews and the VDOT RLD approves any changes to the ESC Plan and the SWPPP. The RLD ensures that all required information is maintained in the SWPPP file and/or documented on the Record Set of Plans for the RLDA in accordance with Section 107.16(e) of the 2016* Road and Bridge Specifications.
- The SWPPP shall include a description of all erosion and sediment control measures (including supporting calculations) that will be installed during the construction process to control any potential pollutants in stormwater discharges from the construction site.
 - The ESC Plan Designer develops the ESC Plan and required calculations for the RLDA. The ESC Plan is incorporated into the construction plans/documents for the RLDA. The ESC calculations are maintained in the project hydraulic files and the location of such files is documented by the ESC Plan Designer in the appropriate note on the SWPPP General Information Sheets for the RLDA.
- The SWPPP shall describe measures to prevent the discharge of solid materials, including building materials, garbage, and debris to state waters, except as authorized by a Clean Water Act § 404 permit.
 - This information is covered by a standard note on the SWPPP General Information Sheets.
- The SWPPP shall describe control measures used to comply with applicable state or local waste disposal, sanitary sewer or septic system regulations.
 - This information is covered by a standard note on the SWPPP General Information Sheets.
- The SWPPP shall include a description of construction and waste materials expected to be stored on site, with updates as appropriate. The SWPPP shall also include a description of controls, including storage practices, to minimize exposure of the materials to stormwater and for spill prevention and response.

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- The Contractor or other such person develops/provides project specific information. The designated RLD reviews and approves the information and ensures that copies of such are maintained in the SWPPP file for the RLDA.
- The SWPPP shall include a description of, and all necessary calculations supporting, all post-construction stormwater management facilities (BMPs) that will be installed prior to the completion of the construction process to control pollutants in stormwater discharges after construction operations have been completed.
 - The Hydraulic Engineer develops the post construction SWM Plan and required calculations. The post construction SWM Plan is incorporated into the construction plans/documents. The post construction SWM calculations are maintained in the project hydraulic files and the location of such files is documented by the Hydraulic Engineer in the appropriate note on the SWPPP General Information Sheets for the RLDA.
- The SWPPP shall include a description of pollutant sources from any applicable support areas and a description of the control measures that will be implemented at those sites to minimize pollutant discharges.
 - The Contractor or other such person develops/provides project specific information. The designated RLD reviews and approves the information and ensures that copies of such are maintained in the SWPPP file for the RLDA.
- The name and phone number of qualified personnel conducting the ESC inspections shall be included in the SWPPP.
 - The VDOT RLD provides the appropriate information on SWPPP Certification form LD-445E and ensures a copy is maintained in the SWPPP file for the RLDA.
- A report summarizing the scope of the ESC inspections, names and qualifications of personnel making the inspections, the dates of the inspections, major observations relating to the implementation of the SWPPP, and any corrective actions taken.
 - The Contractor's Erosion and Sediment Control Contractor Certified (ESCCC) person conducts initial inspections and completes the Construction Runoff Control Inspection Form C-107. The VDOT Certified ESC Inspector verifies inspection information on Form C-107 and the RLD ensures that all of the C-107 forms are maintained in the SWPPP file for the RLD.
- Where the RLDA discharges to a surface water with an approved (as of the effective date of the VPDES Construction Permit) Total Maximum Daily Load (TMDL), the pollutant identified in any Waste Load Allocation (WLA) assigned to a construction activity must be identified in the SWPPP. The SWPPP shall include strategies and control measures to ensure consistency with the assumptions and requirements of any TMDL WLA that applies to the operator's discharge.

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Information contained in the SWPPP shall be updated as necessary by the RLD or his designee to reflect changes required due to differing field conditions and/or construction sequencing. Such changes as well as other information requiring documentation as construction activities are initiated or completed is to be maintained on or with a Record Set of Plans (the Record Plan Set).

- The Record Set of Plans is a paper or electronic copy of the construction plans that is used to document/record the following information:
 - Approved changes/modifications to the proposed ESC Plan.
 - Approved changes/modifications to other components of the SWPPP.
 - Required SWPPP information such as:
 - Dates of beginning and end of major grading operations.
 - Dates of initiation and completion of temporary/permanent stabilization practices.
 - Locations of material, waste, borrow or equipment storage areas included in the project's VPDES Construction Permit coverage.
 - Locations of other potential pollutant sources, such as vehicle fueling, storage of chemicals, concrete wash-out areas, sanitary waste facilities, etc., placed on the construction site.
 - Areas where final stabilization has been accomplished.
 - The Record Plan Set shall be kept current and shall reflect up to date conditions of the RLDA.
 - The Record Plan Set must be maintained at the project site and be available for review upon request (see Section 10.3.1.6 of this document* for exceptions).

10.3.1.8 Computations

All computations to support the ESC and related post construction SWM Plan, and the drainage design plan, including the drainage area map, shall be developed in accordance with the instructions contained in the VDOT Drainage Manual, Hydraulic Design Advisories, related Informational and Instructional Memoranda, and Drainage Design Memoranda, and shall be made part of the project file and the SWPPP for the land disturbance activity.

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10.3.1.9 Field Revisions and Evaluations

The ESC Plan must be fully and effectively implemented throughout the entire construction phase of the project.

During the construction phase of the project, the Project Engineer the Project ESC Inspector, and the contractor shall continuously evaluate the project for areas that may require the deletion/addition/modification of the proposed erosion and sediment control measures/plan in order for the project to remain in compliance with the approved VDOT ESC Standards and Specifications, the Virginia ESC Law and Regulations, and the VPDES Construction Permit conditions (where applicable). Changes in the proposed ESC Plan may be needed due to unforeseen site conditions, contractor scheduling, changes in the proposed sequence of construction or other factors unknown at the time of the development of the proposed ESC Plan.

- Minor changes to the proposed ESC Plan (e.g., deletion/addition/modification to non-engineered items such as silt fence, check dams, inlet protection, etc.) may be approved/authorized by the VDOT DEQ Certified Inspector and/or the designated RLD for the activity.
- When changes to the proposed ESC Plan require detailed hydrologic/hydraulic engineering analysis/calculations (e.g., deletion/addition/modification to engineered items such as sediment traps, sediment basins, etc.), the Project Engineer and/or the Project ESC Inspector shall coordinate a site inspection with the District Hydraulics Engineer and/or the ESC Plan Designer/Hydraulics Engineer. The site inspection should be used to assemble detailed notes, sketches, and photographs to formally document the need for ESC Plan changes. The ESC Plan Designer and/or Hydraulics Engineer will provide the appropriate engineering analysis to document the required changes and to ensure the ESC Plan's continued compliance with the approved VDOT ESC Standards and Specifications, Virginia ESC Law and Regulations, and VPDES Construction Permit conditions (where applicable).
- Any authorized changes to the proposed ESC Plan must be noted on a designated plan set (Record Set) which shall be retained on the project site and made available upon request (see Section 107.16(e) of the 2016* VDOT R&B Specifications).

During the construction phase of the project, the Project Engineer and/or the Project ESC Inspector will periodically, upon request, provide the ESC Plan Designer and/or Hydraulics Engineer with a detailed evaluation report that notes the success or failure of the proposed erosion and sediment control measures depicted in the construction plans (or other such documents) and/or the implementation of different measures as a result of new technologies/products. The VDOT Stormwater Program Administrator is to be provided a copy of all such reports.

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10.3.1.10 Maintenance

Maintenance of the erosion and sediment control items must be continually provided during the duration of the land disturbance activity.

The inspection and maintenance of all temporary and permanent erosion and sediment controls shall be conducted in accordance with Sections 107.16 and 303.03 of the 2016 VDOT R&B Specifications.

Accumulated sediment shall, at a minimum, be removed from erosion and sediment control facilities in accordance with Section 303.03 of the 2016* VDOT R&B Specifications.

10.3.1.11 Standard Forms

LD-445	VPDES Construction Permit Registration Information
LD-445C	Erosion and Sediment Control and Stormwater Management Plan Certification Form
LD-445D	VPDES Construction Permit Termination Notice
LD-445E	Stormwater Pollution Prevention Plan (SWPPP) Certification
C-107	Construction Runoff Control Inspection Form

For the current version of these forms, see the VDOT site at:
<http://vdotforms.vdot.virginia.gov/> .

See Section I Note #15 of the SWPPP General Information Sheets for a list of LD-445 forms and the use on different project types.

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10.4 References

American Association of State Highway and Transportation Officials. (2014). *AASHTO Drainage Manual* (First Edition). Washington, D.C.: American Association of State Highway and Transportation Officials.*

American Association of State Highway and Transportation Officials. (2007). *AASHTO Highway Drainage Guidelines* (Fourth Edition). Washington, D.C.: American Association of State Highway and Transportation Officials.

Virginia Department of Environmental Quality. (1992). *Virginia Erosion & Sediment Control Handbook* (Third Edition). Richmond, VA: Virginia Department of Environmental Quality.

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Appendix 10B-1 Erosion and Sediment Control Plan Details

10.1 DESIGN GUIDELINES

10.1.1 References

- In addition to the information contained herein, the following references contain design and/or construction guidelines and details:
 - VDOT Road and Bridge Standards.
 - VDOT Road and Bridge Specifications.
 - DCR Virginia Erosion and Sediment Control Handbook.
 - VDOT Drainage Manual
 - Hydraulic Design Advisories
 - L&D Instructional and Informational Memorandum

10.1.2 Diversion of Off-Site Stormwater Run-Off

- Stormwater run-off from areas outside the project limits shall, where practical, be diverted around the disturbed areas of the project.
- Erosion and sediment control measures such as diversion ditches, diversion dikes (VDOT Road and Bridge Standard EC-9) (Reference DCR Standard 3.09), stabilized channels, etc. shall be used to limit the stormwater run-off flowing across the disturbed areas of the project.
- Where diversion of runoff from offsite areas is impractical, the flow can be conveyed through the disturbed area in a culvert or a stabilized channel or ditch. Erosion and sediment control measures, such as temporary silt fence, shall be provided along the sides of the ditch or channel to prevent sediment from adjacent disturbed areas from entering the ditch or channel.

10.1.3 Stabilized Construction Entrances - VDOT Road and Bridge Standard. EC-11* (Reference DCR Standard 3.02)

Wherever construction traffic will enter or cross a public road, a stabilized construction entrance is required to minimize the transporting of sediment onto the adjoining surface. This entrance is to be constructed in accordance with the details shown on Standard Drawing EC-11 of the VDOT Road and Bridge Standards.

In areas where clay or other soils that can be easily tracked onto a public roadway are encountered, a wash rack shall be provided to facilitate removal of sediment from vehicles using the entrance. Sediment laden runoff shall be directed to an approved sediment trapping device.

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- Surface water shall be piped under the construction entrance. If piping is impractical, a mountable berm with 5:1 slopes will be permitted.
- Maintenance must be provided to assure continuous performance of the stabilized construction entrance.
- The need and potential locations for stabilized construction entrances should be discussed at the Field Inspection meeting or discussed with the appropriate District Environmental Manager or Construction Engineer.

**10.1.4 Temporary Silt Fence - VDOT Road and Bridge Standard EC-5
(Reference DCR Standard 3.05 & 3.08)**

- Temporary Silt Fence is to be used to control sediment in non-concentrated (sheet) flow areas.
- Temporary Silt Fence is to be used at the toe of embankments where the fill height is equal to or greater than 5' (1.5 m).
- Additional erosion and sediment control measures must be provided to supplement Temporary Silt Fences located along the toe of embankments where the area draining to Temporary Silt Fence exceeds 11,000 square feet (1020 m²) per 100 linear feet (30 m) of Silt Fence.

**10.1.5* Brush Barriers - VDOT Road and Bridge Standard EC-5
(Reference DCR Standard 3.06)**

- Brush Barriers may to be used to control sediment in non-concentrated (sheet) flow areas.
- Additional erosion and sediment control measures must be provided to supplement Brush Barriers located parallel along the toe of embankments if the area draining to the Brush Barrier exceeds 11,000 square feet (1020 m²) per 100 linear feet (30 m) of Brush Barrier.
- It is desirable, where feasible, that Brush Barriers remain in place after completion of the project in order to provide an area for wildlife habit. Any Brush Barriers left in place must have any geotextile fabric removed.

10.1.6 Inlet Protection - VDOT Road and Bridge Standard EC-6 (Reference DCR Standard 3.07)

- Provide Inlet Protection Type A at:

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- Grate inlets in graded median and roadside ditches.
- Grate inlets in sump areas.
- Grate inlets in other ditch locations or areas of concentrated flow.
- Provide Inlet Protection Type B at:
 - Curb opening inlets as needed.
- Sediment forebays shall be utilized at drop inlet locations where increased efficiency of sediment removal is desired or where drainage area/storage volume requirements dictate. The need for sediment forebays may be determined by the designer during the design phase of the project or by the Project Engineer or District Environmental Staff during the construction phase of the project.

10.1.7* Sediment Traps – VDOT Road and Bridge Standard EC-7 (Reference DCR Standard 3.13)

- Temporary Sediment Traps should be used to detain sediment-laden runoff from small disturbed areas. Use of Temporary Sediment Traps should be limited to those locations where the total contributing drainage area is less than 3 acres (1.2 hectares).
- Temporary Sediment Traps are normally located in areas of concentrated flow. The outflow from Temporary Sediment Traps is normally controlled by the use of a rock checkdam.
- Temporary Sediment Traps shall not be constructed in live streams.
- The storage volume for Temporary Sediment Traps shall be 134 cubic yards per acre (254 m³ per hectare) of the total contributing drainage area and shall consist of 50% in the form of wet storage (excavated area) and 50% in the form of dry storage.
- The need and location for Temporary Sediment Traps is to be determined by the Hydraulics Engineer based on the anticipated sequence of construction.
- The general design for Temporary Sediment Traps is to be in accordance with the details shown on Standard Drawing EC-7 of the VDOT Road and Bridge Standards. Specific dimensions for each Temporary Sediment Trap are to be determined by the designer and summarized on the Temporary Sediment Trap Detail Sheet.

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- The Project Engineer, in conjunction with the District Environmental Staff, shall determine the time schedule for the removal of the Temporary Sediment Traps.

10.1.8* Temporary Sediment Basins (Reference DCR Standard 3.14)

- Temporary Sediment Basins should be used to detain sediment laden runoff from disturbed areas where the total contributing drainage area is 3 acres (1.2 hectares) or greater. The maximum drainage area controlled by a Temporary Sediment Basin should not exceed 100 acres (40 hectares).
- The sediment storage volume for Temporary Sediment Basins shall be 134 cubic yards per acre (254 m³ per hectare) of the total contributing drainage area. The storage volume shall consist of 50% in the form of wet storage (permanent pool) and 50% in the form of dry storage. The hydraulic performance of the Temporary Sediment Basin shall be predicated on the runoff from the entire watershed.
- The need and location for Temporary Sediment Basins is to be determined by the designer based on the anticipated sequence of construction.
- Specific details and dimensions for each Temporary Sediment Basin are to be determined by the designer and the design details (including wet and dry storage volumes) are to be included in the construction plans.
- Concentrated stormwater discharge from Temporary Sediment Basins shall be discharged directly into an adequate natural or man-made receiving channel as defined by Minimum Standard 19 (MS-19) of the Virginia Erosion and Sediment Control Regulations.
- The designer is referred to the Virginia Erosion and Sediment Control Handbook for further design parameters and construction details.
- The Project Engineer, in conjunction with the District Environmental Staff, shall determine the time schedule for removal of Temporary Sediment Basins.
- Permanent Stormwater Management (SWM) basins may be used as temporary sediment basins during the construction phase of the project by modifying the outflow control structure in order to provide the required wet and dry storage volumes. Typical details for modifying a standard riser structure are shown on Standard Drawing SWM-DR.

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10.1.9* Slope Drains - VDOT Standard EC-10 (Reference DCR Standard 3.15)

- Slope Drains are to be used in high (8' or greater) (2.4 m or greater), long fill situations to control slope erosion. Exceptions would be where the length of fill is less than 100' (30 meters) or at bridge locations where run-off is being handled by other means.
- The need for Slope Drains is to be determined by the designer.
- During the construction phase of the project, the Project Engineer and/or the District Environmental Staff may require additional slope drains as dictated by field conditions.

10.1.10 Culvert Outlet Protection - VDOT Road and Bridge Standard EC-1& RECP Permanent (Reference DCR Standard 3.18)

- Erosion control protection shall be provided at the outlet of each culvert where required in accordance with the guidelines set forth in Chapter 8 of this Manual.
- The placement of the outlet protection shall be in accordance with Standard Drawing EC-1or RECP Permanent.
- The Project Engineer and/or the District Environmental Staff shall inspect the outlet ends of all culverts during the construction phase of the project. Where not specified on the plans, but warranted by field conditions, additional outlet protection shall be added in order to ensure the stability of the area adjacent to the culvert outlet.

10.1.11 Rock Check Dams - VDOT Road and Bridge Standard EC-4 (Reference DCR Standard 3.20)

- Type I Rock Check Dams are to be used in trapezoidal ditches where the bottom width is greater than 2' (0.6 m).
- Type II Rock Check Dams are to be used in triangular (vee) ditches and trapezoidal ditches where the bottom width is 2' (0.6 m) or less.
- Rock Check Dams may be designated as permanent SWM structures that are to be left in place after completion of the project in order to function as a part of the overall SWM Plan for the project. Rock Check Dams designated as permanent structures, and located within the clear zone adjacent to a travelway, shall be designed so as not to present a hazard to traffic (see Standard Drawing EC-4).

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- During the construction phase of the project, the Project Engineer and/or the District Environmental Monitor may approve the use of geosynthetic check dams in lieu of Rock Check Dams Type II provided that the check dams are not designated as permanent stormwater management structures and provided that there is no additional cost to the Department. The Materials Division's Approved Products List includes the names of approved geosynthetic check dam manufacturers.

**10.1.12* Temporary Diversion Channel - VDOT Road and Bridge Standard EC-12
(Reference DCR Standard 3.24 & 3.25)**

- A Temporary Diversion Channel should be used where culvert installation is proposed in a live stream environment (perennial or intermittent) and where it will be necessary to divert the stream in order for the culvert to be installed in the dry.
- The designer, using USGS Topographical Maps and/or field observations, shall determine the need for a Temporary Diversion Channel and identify the most feasible location for the channel.
- When it is determined that a Temporary Diversion Channel is required, the designer shall determine the following:
 - The length of the Temporary Diversion Channel.
 - The bottom width of Temporary Diversion Channel necessary to essentially match that of the existing low water stream channel.
 - The depth of the Temporary Diversion Channel (average ground surface elevation minus average natural streambed elevation).
 - The class of lining required based on the following:

Specify Class A Lining where the Temporary Diversion Channel slope is less than 2 percent.

Specify Class B Lining where the Temporary Diversion Channel slope is equal to or greater than 2 percent.
- The location of the Temporary Diversion Channel should be shown on the appropriate ESC plan sheet, when using the Multiple Phase ESC Plan concept, or the Construction plan sheet, when using the Single Phase ESC Plan concept.

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- Temporary Silt Fence shall be provided along both sides of the Temporary Diversion Channel.

10.1.13* Dewatering Basins - VDOT Road and Bridge Standard EC-8 (Reference DCR Standard 3.26)

- Dewatering Basins are provided to receive sediment-laden water pumped from a construction site in order to allow for filtration before the water reenters a natural watercourse.
- Accumulated sediment in the Dewatering Basin shall be removed and disposed of in an approved disposal area outside of the 100-year flood plain, unless otherwise noted on the plans.
- Surface water flow shall be diverted around the Dewatering Basin.
- A stabilized conveyance shall be provided from the outlet of the Dewatering Basin to the receiving channel.
- The need for Dewatering Basins is to be determined by the Hydraulics Engineer during the design phase of the project.
- The field location of Dewatering Basins is to be determined by the Contractor during the construction phase of the project.
- During the construction phase of the project, the Project Engineer and/or the District Environmental Staff may approve the use of a synthetic dewatering basin in lieu of the dewatering basin shown on Standard Drawing EC-8 of the VDOT Road and Bridge Standards provided that there is no additional cost to the Department regardless of the number of synthetic dewatering basins required for each site.

10.1.14 Turbidity Curtains (Reference DCR Standard 3.27)

- A Turbidity Curtain is used to provide sedimentation protection for a watercourse from up-grade land disturbance or from dredging or filling operations within the watercourse.
- A Turbidity Curtain may be used in both non-tidal and tidal watercourses where intrusion into the watercourse by construction activities or sediment movement is unavoidable.

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- Turbidity Curtains should not be placed across the main flow of a significant body of moving water but instead should be located parallel to the direction of flow.
- The Turbidity Curtain should extend for the entire depth of the water to the bed (bottom) of the channel except in locations subject to tidal action and/or significant wind or wave forces.
- At locations subject to tidal action and/or significant wind and wave forces, the bottom of the Turbidity Curtain should extend no closer than 1.0' (0.3 m) above the bed (bottom) of the channel at mean low water.
- An impervious material should be used for the Turbidity Curtain for general applications.
- A pervious material should be used for the Turbidity Curtain for special applications in areas of tidal or moving water where there is a need to extend the curtain all the way to the bed (bottom) of the channel.
- The maximum depth (height) of the curtain shall be no greater than 10 feet (3.0 m) for all stages of water level anticipated during the duration of the curtain's installation.
- The designer is referred to the Virginia Erosion and Sediment Control Handbook for further design parameters and construction details.

10.1.15* Slope Interrupter Devices – VDOT Road and Bridge Standard EC-15

- Temporary slope interrupter devices such as fiber rolls may be provided to trap sediment and moisture on slopes until vegetation can provide long-term stabilization.
- Provide slope interrupter devices for all slopes 3:1 and steeper at a maximum spacing of 25'.

10.1.2 DESIGN CONSIDERATIONS

10.1.2.1 Right of Way/Easement:

- Prior to the Public Hearing Stage of the project, the need for fee right-of-way, permanent easement or temporary easement to accommodate the construction and maintenance of temporary diversion channels, sediment traps, sediment basins or other perimeter erosion and sediment control devices should be addressed.

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- All right of way or easements needed to accommodate the construction and maintenance of temporary diversion channels and erosion and sediment control measures shall be shown on the plans prior to their submission for right-of-way acquisition.

10.1.2.2 Safety

- Guardrail or fencing around sediment traps or sediment basins should be specified where it is determined to be needed for the safety of pedestrians or vehicles.
- The need for guardrail or fencing should be determined by the District Construction Engineer or other person so designated.

10.1.2.3 Maintenance Access

- The need to maintain erosion and sediment control, control measures during construction shall be considered in the development of the ESC plan.
- The plan design shall incorporate a means of access (e.g., sufficient right-of-way, easements, flattened slopes, etc.) for the maintenance of sediment traps, sediment basins and other erosion and sediment control measures.

10.1.3 PLAN DETAILS

10.1.3.1 Symbols

- Standard symbols are to be used to depict erosion and sediment control items on the plans in accordance with General Note E-3* shown in the latest Location and Design Instructional and Informational Memorandum (D) 110 and in accordance with instructions in the VDOT CADD Manual.

10.1.3.2 Check Dams

- Rock Check Dams that are to function as a part of the permanent SWM Plan for the project should be designated on the plans as follows:

“Rock Check Dam Type (specify) - Permanent SWM Structure (to remain in place after project completion).”

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10.1.3.3 Dewatering Basins

- Do not show specific locations on the plans.
- The description of the applicable drainage structure (or a separate description note when utilizing individual sheets to depict a phased ESC Plan) should note the need for a Dewatering Basin(s) and specify the number required.

10.1.3.4 Stabilized Construction Entrances

- The specific locations of Stabilized Construction Entrances will not be shown on the plans. A note should be included on the appropriate plan sheet(s) specifying the general location (station, lane, roadway, etc.) where it is anticipated that Stabilized Construction Entrances will be required.

10.1.3.5 Filter Cloth

- Where existing fence is available for the attachment of the Filter Cloth, the plans are to specify the following: “Filter Cloth Req’d. (Attach to Exist. Fence).”

10.1.3.6 Slope Drains

- The specific locations of Slope Drains will not be shown on the plans. A note should be included on the appropriate plan sheet(s) specifying the general location (station to station, lane, roadway, etc.) and estimated quantity of Slope Drains and Culvert Outlet Protection Class **1***, St’d. EC-1 required.

10.1.3.7 Temporary Diversion Channel

- When the location is shown on an individual phased ESC Plan Sheet, the description for the Temporary Diversion Channel should specify the width of the channel required and the class of lining required (A or B). Temporary Silt Fence along both sides of the Temporary Diversion Channel should be specified.
- When the location is shown on the Construction plan sheet, the description for the Temporary Diversion Channel should be included in the description for the applicable drainage structure. The following information should be included in the drainage description:

Temporary Diversion Channel Req’d. Width = (specify)
(specify) cu. yds. (m^3) Temporary Diversion Channel Excavation
(specify) sq. yds. (m^2) Temporary Diversion Channel Lining, Class (specify)
(specify) ft. (m) Temporary Silt Fence Req’d.

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- The plan description calls attention to the need for a Temporary Diversion Channel and defines the width of the channel and the class of lining required.
- The **designer** should be liberal when estimating the length of Temporary Diversion Channel required in order to avoid significant cost overruns during construction.
- The Contractor, with approval of the Project Engineer and/or the District Environmental **Staff**, will have the latitude to field locate the Temporary Diversion Channel where needed to best fit his planned construction sequencing. The Contractor is paid for the actual quantity of excavation and quantity of lining installed.
- Sufficient right of way and/or temporary/permanent easement should be provided in order to allow the contractor the latitude to locate the Temporary Diversion Channel on either side of the proposed structure. Location of wingwalls or other appurtenances that protrude beyond the neat lines of the culvert's barrel shall be considered when locating the Temporary Diversion Channel and establishing the required R/W or Easement.

10.1.3.8 General Notes

- See the latest Location and Design Instructional and Informational Memorandum (D) 110 for the applicable Erosion and Sediment Control Notes that are to be included on the General Notes Sheet of the plans.

10.1.4 MAINTENANCE

- Accumulated sediment shall, at a minimum, be removed from erosion and sediment control facilities as follows:
 - Sediment Traps & Basins - When the wet storage volume has been reduced by approximately 50%.
 - Temporary Silt Fence– When it retains sediment up to ½ of its height.
 - Rock Check Dams – When the storage capacity behind the dam has been reduced by approximately 50%.
 - Dewatering Basins – When the excavated volume has been reduced by approximately 50%.

- Slope Interrupter – When it retains sediment up to ½ of its height. *
- All other erosion and sediment control facilities – When the capacity, height or depth has been reduced by approximately 50%.

10.1.5 BASIS OF PAYMENT

10.1.5.1 Siltation Control Excavation

- All silt removal and sediment cleanout from erosion and sediment control items will be measured and paid for as “cubic yards (m³) of Siltation Control Excavation.”

10.1.5.2 Rock Check Dams

- To be measured and paid for per each for the type specified.

10.1.5.3 Temporary Silt Fence

- To be measured and paid for in linear feet (m).

10.1.5.4 Temporary Sediment Basins and Sediment Traps

- Excavation for Temporary Sediment Basins or Sediment Traps will be measured and paid for as “cubic yards (m³) Temporary Sediment Basin Excavation.” If additional fill material is needed for dams or berms, it will be measured and paid for as “cubic yards (m³) of Regular Excavation, Borrow Excavation or Embankment.”

10.1.5.5 Dewatering Basins

- To be measured and paid for per each.

10.1.5.6 Inlet Protection

- To be measured and paid for per each for the type specified.

10.1.5.7 Temporary Diversion Dike

- Will not be measured for payment, but the cost shall be included in the price bid for other appropriate items.

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10.1.5.8 Stabilized Construction Entrance

- Will not be measured for payment but the cost shall be included in the price bid for other appropriate items.

10.1.5.9 Slope Drains

- To be measured and paid for per each regardless of size or length.
- EC-1 Class 1 to be measured and paid for per square yard or ton

10.1.5.10 Brush Silt Barriers

- Will not be measured for payment but the cost shall be included in the price bid for other appropriate items.

10.1.5.11 Geotextile Fabric

- When attached to brush barriers or an existing fence, payment will be made for square yards (m^2) of Geotextile Fabric.

10.1.5.12 Culvert Outlet Protection

- (Std. EC-1, Class A1 & Class I & Class II - to be measured and paid for in square yds or tons.
- (Std. RECP Permanent,* soil stabilization mat – to be measured and paid for in square yds.

10.1.5.13 Turbidity Curtains

- To be measured and paid for in linear feet (m) of the type specified, measured from edge of curtain to edge of curtain along the support cable.

10.1.5.14 Temporary Diversion Channel

- To be measured and paid for in cubic yards (m^3) Temporary Diversion Channel Excavation and square yards (m^2) Temporary Diversion Channel Lining for the Class specified.

10.1.5.15 Slope Interrupter

- To be measured and paid for in linear feet (m).

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10.1.6 QUANTITY ESTIMATES

10.1.6.1 Summary Sheet

- All estimated quantities for erosion and sediment control items are to be summarized on the Erosion Control Summary Sheet.
- Estimated quantities are to be shown for each phase of the ESC Plan.

10.1.6.2 Rock Check Dams

- Summarize a quantity of 4.74 cubic yards (3.6 m^3) of Siltation Control Excavation for each Rock Check Dam Type I specified. This should allow for two cleanouts.
- Summarize a quantity for 0.32 cubic yards (0.2 m^3) of Siltation Control Excavation for each Rock Check Dam Type II specified. This should allow for two cleanouts.

10.1.6.3* Temporary Silt Fence

- Summarize a quantity for cubic yards (m^3) of Siltation Control Excavation as follows:

Metric - 0.25 m^3 of Siltation Control Excavation for each meter of Temporary Silt Fence specified.

Imperial - 0.17 Cubic yards of Siltation Control Excavation for each linear foot of Temporary Silt Fence specified.

10.1.6.4 Brush Silt Barrier

- The estimated linear feet (m) is to be shown on the Erosion Control Summary Sheet.

10.1.6.5 Temporary Sediment Basins and Traps

- Summarize the cubic yards (m^3) of Temporary Sediment Basin Excavation on the Erosion Control Summary Sheet. If Borrow or Embankment is needed, it is to be included in roadway totals on the Grading Diagram and Summary Sheet.
- The Grading Diagram is to reflect how the cubic yards (m^3) of Temporary Sediment Basin Excavation and cubic yards (m^3) of Embankment is to be distributed.

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- Temporary Sediment Basin control structure (riser pipe) – Summarize pay item as linear feet (meters) of Temporary Sediment Riser Pipe (size) on the Erosion Control Summary Sheet.
- Any culvert pipe necessary for a temporary sediment basin shall be included with other applicable pipe on the Drainage Summary Sheet.
- Summarize a quantity for cubic yards (m^3) of Siltation Control Excavation that is equal to 50% of the total volume (wet storage volume plus dry storage volume) of the basin or trap. This will allow for two cleanouts.

10.1.6.6* Dewatering Basin

- The number of Dewatering Basins specified for each applicable site shall consider any potential phased construction of the proposed drainage structure. At a minimum, the following number of dewatering Basins shall be specified:
 - One Dewatering Basin for each pipe(s) or major structure that has a combined hydraulic opening of 12.6 square feet (1.17 m^2) (48" (1200 mm) diameter pipe or equivalent) or greater including bridges 20' (6 m) or less in length.
 - Two Dewatering Basins for each bridge over 20' (6 m) in length.
- Summarize a quantity of 4 cubic yards (3.1 m^3) of Siltation Control Excavation for each Dewatering Basin specified, based on a minimum Dewatering Basin size of 6' x 6' x 3' (2 m x 2 m x 1 m). This will allow for two cleanouts.

10.1.6.7 Inlet Protection

- Type A
 - Summarize a quantity of 15 cubic yards (11.5 m^3) of Siltation Control Excavation for each Drop Inlet Silt Trap Type A specified at St'd DI-5, DI-7A,7B and DI-12,12A,12B,12C Drop Inlet locations. This should allow for two cleanouts.
 - Summarize a quantity of 5 cubic yards (3.8 m^3) of Siltation Control Excavation for each Drop Inlet Silt Trap Type A specified at Standard DI-1 and DI-7 Drop Inlet locations. This should allow for two cleanouts.

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- Type B
 - Summarize a quantity of 5 cubic yards (3.8 m³) of Siltation Control Excavation for each Drop Inlet Silt Trap Type B specified at curb drop inlet locations. This should allow for two cleanouts.

10.1.6.8* Stabilized Construction Entrance

- The estimated number of Stabilized Construction Entrances is to be shown on the Erosion Control Summary Sheet.

10.1.6.9 Slope Drains

- Summarize the estimated number of Slope Drains and the quantity of Culvert Outlet Protection Class 1, St'd. EC-1 on the Erosion Control Summary Sheet.
- The number of Slope Drains required is to be estimated as follows:
 - One Slope Drain for each 250 linear feet (75 m), or portion thereof, for fills 8 feet (2.4 m) in height or greater, for each roadway baseline; e.g., 200' (60 m) of fill = 1 Slope Drain; 580' (175 m) of fill = 3 Slope Drains.

10.1.6.10 Erosion Control Mulch

- Summarize a quantity on the Erosion Control Summary Sheet when recommended by the Environmental Division.
- This material is estimated at the rate of 50 square yards per 100 feet (135 m² per 100 meters) of roadway alignment.

10.1.6.11 Turbidity Curtain

- Summarize as linear feet (meters) of Turbidity Curtain for the type specified (Pervious or Impervious) on the Erosion Control Summary Sheet.

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10.1.6.12 Temporary Diversion Channel

- An estimated quantity of Temporary Diversion Channel Excavation and Temporary Diversion Channel Lining for the Class specified (A or B) is to be shown on the Erosion Control Summary Sheet.
- Silt fence along both sides of channel is to be measured and paid for separately and summarized on the Erosion Control Summary Sheet.
- The designer shall estimate the cubic yards (m^3) of temporary Diversion Channel Excavation and the square yards (m^2) of Temporary Diversion Channel Lining based on the estimated width and depth of the channel using Table 1.

10.1.6.13* Slope Interrupter

- Summarize a quantity for cubic yards (m^3) of Siltation Control Excavation as follows:

Metric - 0.25 m^3 of Siltation Control Excavation for each meter of Slope Interrupter specified.

Imperial - 0.17 Cubic yards of Siltation Control Excavation for each linear foot of Slope Interrupter specified.

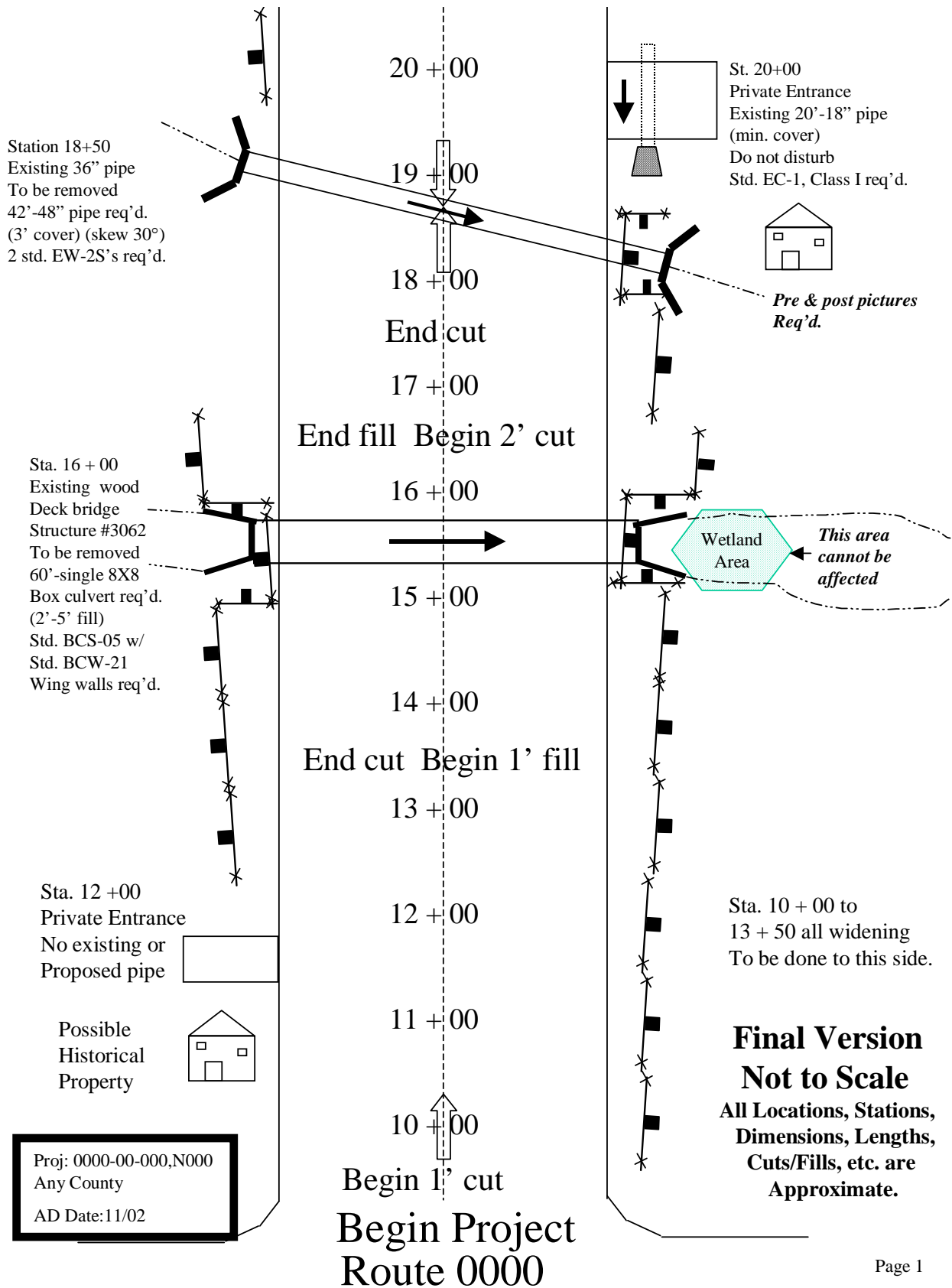
* Rev 1/17

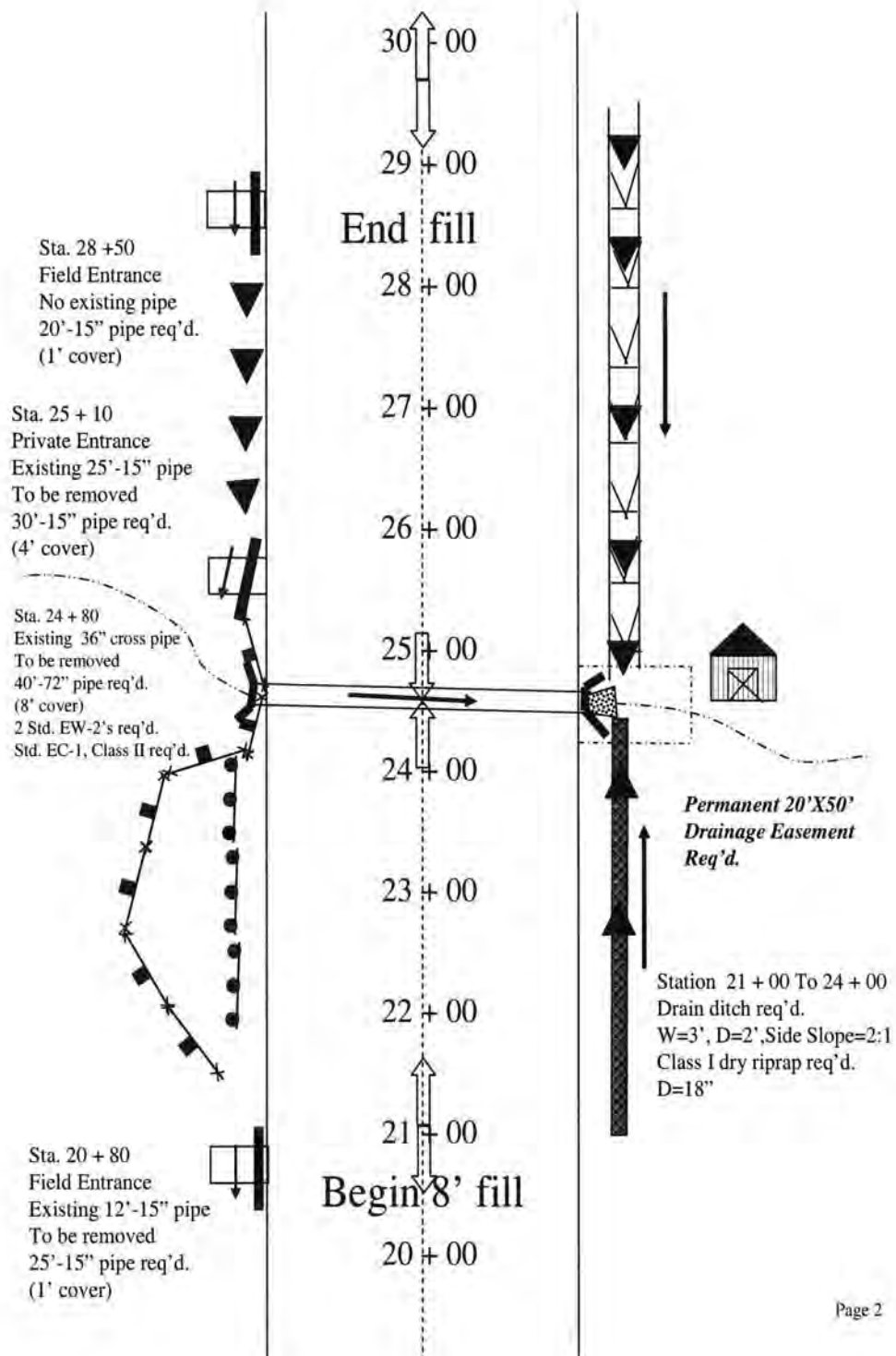
TABLE 1 - TEMPORARY DIVERSION CHANNELS (IMPERIAL)									
S.Y. LINING / C.Y. EXCAVATION (PER LIN. FT.)									
		3' WIDTH	4' WIDTH	5' WIDTH	6' WIDTH	7' WIDTH	8' WIDTH	9' WIDTH	10' WIDTH
1' DEPTH	S.Y.	0.83	0.94	1.10	1.20	1.30	1.40	1.50	1.60
1' DEPTH	C.Y.	0.19	0.22	0.26	0.30	0.33	0.37	0.41	0.44
2' DEPTH	S.Y.	1.32	1.44	1.54	1.66	1.77	1.88	1.98	2.10
2' DEPTH	C.Y.	0.52	0.59	0.67	0.74	0.81	0.89	0.96	1.04
3' DEPTH	S.Y.	1.82	1.94	2.05	2.16	2.27	2.38	2.49	2.60
3' DEPTH	C.Y.	1.00	1.11	1.22	1.33	1.44	1.56	1.67	1.78
4' DEPTH	S.Y.	2.32	2.43	2.54	2.66	2.77	2.88	2.99	3.10
4' DEPTH	C.Y.	1.63	1.78	1.93	2.07	2.22	2.37	2.52	2.67
5' DEPTH	S.Y.	2.82	2.93	3.04	3.16	3.27	3.38	3.48	3.60
5' DEPTH	C.Y.	2.41	2.59	2.78	2.96	3.15	3.33	3.52	3.70
6' DEPTH	S.Y.	3.31	3.43	3.53	3.64	3.76	3.87	3.98	4.09
6' DEPTH	C.Y.	3.33	3.56	3.78	4.00	4.22	4.44	4.67	4.89
7' DEPTH	S.Y.	3.81	3.92	4.03	4.14	4.26	4.39	4.48	4.59
7' DEPTH	C.Y.	4.41	4.67	4.93	5.19	5.44	5.70	5.96	6.22
8' DEPTH	S.Y.	4.31	4.42	4.53	4.64	4.76	4.87	4.98	5.09
8' DEPTH	C.Y.	5.63	5.93	6.22	6.52	6.81	7.11	7.41	7.70
9' DEPTH	S.Y.	4.81	4.92	5.03	5.14	5.25	5.36	5.47	5.58
9' DEPTH	C.Y.	7.00	7.33	7.67	8.00	8.33	8.67	9.00	9.33
10' DEPTH	S.Y.	5.30	5.41	5.52	5.64	5.75	5.86	5.97	6.08
10' DEPTH	C.Y.	8.52	8.89	9.26	9.63	10.00	10.37	10.74	11.11

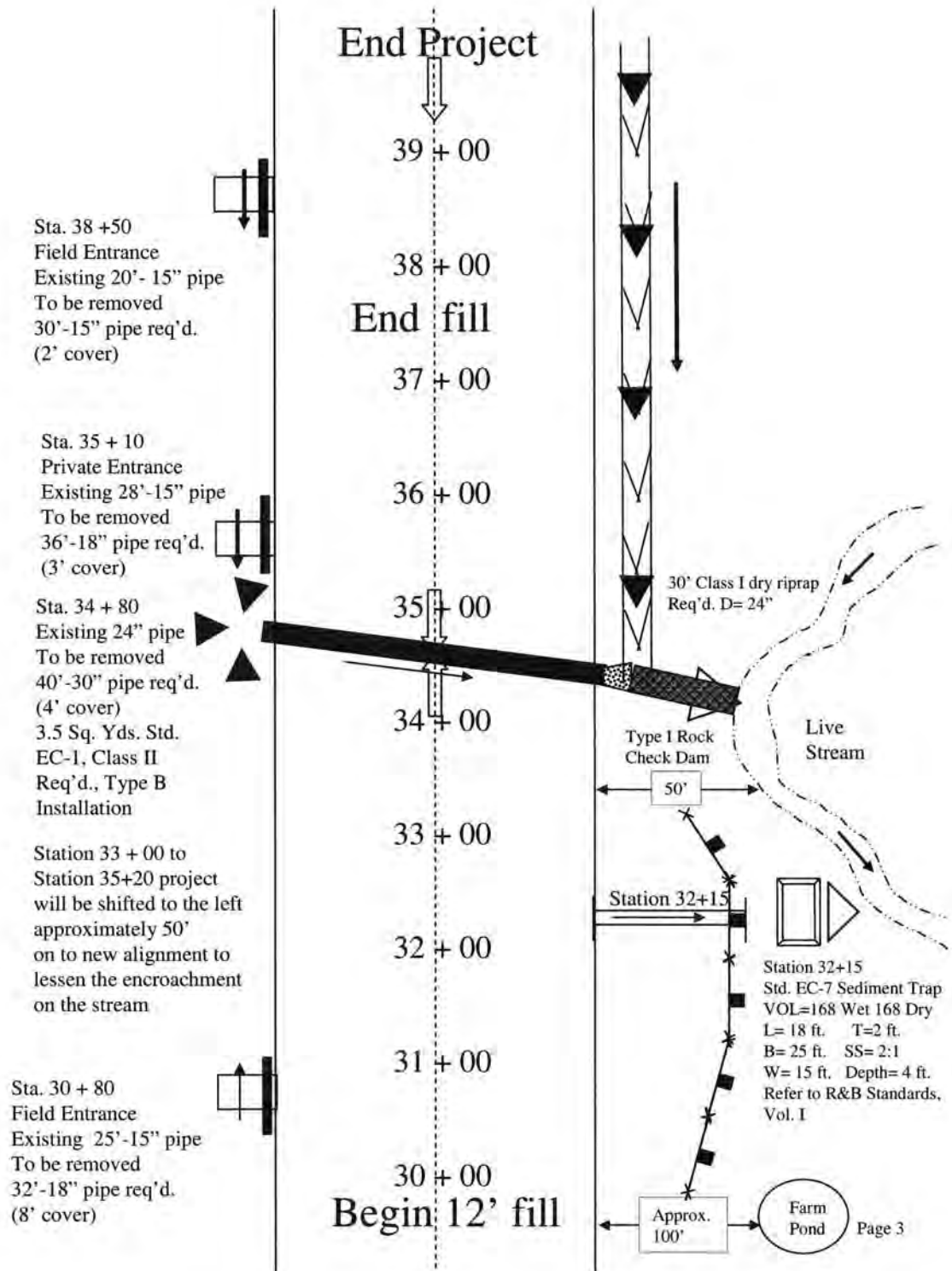
TABLE 1 - TEMPORARY DIVERSION CHANNELS (METRIC)						
M ² LINING / M ³ EXCAVATION (PER METER)						
		1.00 m WIDTH	1.50 m WIDTH	2.00 m WIDTH	2.50 m WIDTH	3.00 m WIDTH
0.30mDepth	m ²	2.34	2.84	3.34	3.84	4.34
0.30mDepth	m ³	0.48	0.63	0.78	0.93	1.08
0.60mDepth	m ²	3.68	4.18	4.68	5.18	5.68
0.60mDepth	m ³	1.32	1.62	1.92	2.22	2.52
0.90mDepth	m ²	5.02	5.52	6.02	6.52	7.02
0.90mDepth	m ³	2.52	2.97	3.42	3.87	4.32
1.20mDepth	m ²	6.37	6.87	7.37	7.87	8.37
1.20mDepth	m ³	4.08	4.68	5.28	5.88	6.48
1.50mDepth	m ²	7.71	8.21	8.71	9.21	9.71
1.50mDepth	m ³	6.00	6.75	7.50	8.25	9.00
1.80mDepth	m ²	9.05	9.55	10.05	10.55	11.05
1.80mDepth	m ³	8.28	9.18	10.08	10.98	11.88
2.10mDepth	m ²	10.39	10.89	11.39	11.89	12.39
2.10mDepth	m ³	10.92	11.97	13.02	14.07	15.12
2.40mDepth	m ²	11.73	12.23	12.73	13.23	13.73
2.40mDepth	m ³	13.92	15.12	16.32	17.52	18.72
2.70mDepth	m ²	13.07	13.57	14.07	14.57	15.07
2.70mDepth	m ³	17.28	18.63	19.98	21.33	22.68
3.00mDepth	m ²	14.42	14.92	15.42	15.92	16.42
3.00mDepth	m ³	21.00	22.50	24.00	25.50	27.00







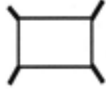












EROSION AND SEDIMENT CONTROL PLAN

EXAMPLE NO PLAN PROJECT







<p style="text-align: center;">KEY 0000-00-000,N000</p>	
 Pipe Existing	 Type II rock check dam
 Pipe – 42” or smaller	 Type I rock check dam
 Pipe – 48” or larger	 Silt Fence
 Box Culvert	 Rolled Erosion Control Product (RECP) Temporary
 Stream or edge of water	 Rolled Erosion Control Product (RECP) Permanent
 Guardrail	 EC-1 Outlet protection
 Pond	 Dry riprap
 Potential wetland area	 Sediment trap
 House/dwelling	 Temporary slope drain
 Barn	
<p>NOTE:</p> <ul style="list-style-type: none"> • A temporary diversion channel St'd EC-12 may be required for work in live streams. Must be reviewed and approved by Environmental. (R&B Standard) • All E&S controls need to be removed within 30 days after project is stabilized. (MS 18) • All referenced standards and E&S controls should conform to the latest edition of the VDOT Road & Bridge Standards. • Refer to contract documents for all quantities. (e.g.: minor structure excavation, bedding, backfill etc.) • Dewatering devices may be required at live stream pipe installations. • All disturbed areas will be stabilized with seed and mulch in accordance with the Roadside Development Sheet. 	